U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-260 976

Air Pollution Abstracts
Volume 6, Number 11
November 1975
52043-52797

Environmental Protection Agency, Research Triangle Park, N C

Nov 75

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
APABCA-6-11-1975

2.

3. RECIPIENT'S ACCESSION NO.

4. TITLE AND SUBTITLE
Air Pollution Abstracts Volume 6, No. 11

5. REPORT DATE
November 1975

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Air Pollution Technical Information Center
Research Triangle Park, North Carolina 27711

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
Same

13. TYPE OF REPORT AND PERIOD COVERED

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 52043 - 52797.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Abstracts Information retrieval		13B 5B

18. DISTRIBUTION STATEMENT
Unlimited

19. SECURITY CLASS *(This Report)*

20. SECURITY CLASS *(This page)*

21. NO. OF PAGES
167

22. PRICE
$6.75

EPA Form 2220-1 (9-73)

344039

PB 260 976

Volume 6, No. 11
November 1975
CODEN:APABCA 6(11)1975
ISSN:0027-5956

AIR POLLUTION ABSTRACTS

52043-52797

NOVEMBER 1975

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

AIR POLLUTION ABSTRACTS

VOLUME 6, NO. 11 NOVEMBER 1975

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

Subscribers receiving 'Air Pollution Abstracts'
directly from the U. S. Government Printing Office
should address any inquiries regarding issues
subsequent to June 1972 to:

U. S. Government Printing Office, Washington, D., C. 20402

The Administrator of the Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 31, 1975.

CONTENTS

Introduction ....
APTIC Publications ....
Recent Contract Awards ....
Subject Fields and Scope Notes ....
Abstract Bulletin ....
Subject Index SI-1

The terms that most closely describe the information presented in the documents are arranged alphabetically.

Author Index AI-1

Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

EPA's staff should direct requests for full text duplicates (if not locally available) to APTIC, using the order form provided. Translations of foreign language documents may be arranged for these personnel upon request. Commercially available translations may also be requested from APTIC.

For non-EPA readers, APTIC can provide copies of only those articles that have been written by EPA's air pollution personnel and have not been published in the open literature. Requests for all other articles should be directed to local libraries, publishers, or authors, with the following exception. Copies of EPA's numbered air pollution technical publications, as indicated in the citation, will be provided, while supplies permit, only to certain qualified requesters, e.g., its current contractors, grantees, and air pollution control agencies; a list of these publications is available. When requesting any publications, please include the complete citation. Translations are cited with their sources whenever possible. If a translation proves to be unavailable from the source cited, or if a translation is cited without a source, it may be located through APTIC or through the National Translations Center, 35 West 33rd Street, Chicago, Illinois 60616. In order to promote scientific and technical progress by facilitating access to each of the abstracted documents, APTIC is assuring that they are also held at EPA Headquarters and at each of the EPA Regional Offices. Information regarding their accessibility may be sought from the libraries there. Their addresses are:

U.S. Environmental Protection Agency
Region I Library
Room 2211-B, JFK Federal Building
Boston, Massachusetts 02203

U.S. Environmental Protection Agency
Region II Library
26 Federal Plaza
Room 908
New York, New York 10007

U.S. Environmental Protection Agency
Region III Library
Curtis Bldg., 6th and Walnut Streets
Philadelphia, Pennsylvania 19106

U.S. Environmental Protection Agency
Region IV Library
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

U.S. Environmental Protection Agency
Region V Library
230 Dearborn Drive Room 1455A
Chicago, Illinois 60604

U.S. Environmental Protection Agency
Region VI Library
1600 Patterson Street
Dallas, Texas 75201

U.S. Environmental Protection Agency
Region VII Library
1735 Baltimore Avenue, Room 249
Kansas City, Missouri 64108

U.S. Environmental Protection Agency
Region IX Library
100 California Street
San Francisco, California 94111

U.S. Environmental Protection Agency
Headquarters Library, Room 2404
Waterside Mall
401 M Street, S.W.
Washington, D. C. 20460

U.S. Environmental Protection Agency
Region VIII Library
1860 Lincoln Street, Suite 900
Denver, Colorado 80203

U.S. Environmental Protection Agency
Region X Library
1200 Sixth Avenue
Seattle, Washington 98101

When NTIS or DDC or GPO appear at the end of the citation, they designate the sales outlet offering the document. NTIS refers to: National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161, Telephone (703) 321-8543. The designation NTIS is followed by their order number. NTIS sells paper copies at various prices and microfiche at $2.25. All foreign buyers must add the following charges to each order: $2.50 for each paper copy, and $1.50 for each microfiche. If payment does not accompany a U.S. order, NTIS will charge an additional $5.00 per order. DDC refers to: Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. Users registered at DDC may order such documents from them at the same prices as NTIS'. GPO refers to: Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Telephone (202) 541-3311. GPO sells paper copies at various prices; GPO does not sell microfiche. Payment must accompany all orders to GPO.

The serial publications (journals, periodicals, etc.) being scanned number approximately 7,000. A list of approximately 1,000 of the most productive publications with the address of each publisher is available upon request.

As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

The acronym GPO which appears in the above listing refers to: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be directed to GPO only; payment must accompany all orders.

RECENT CONTRACT AWARDS

from the

Durham Contract Operations
Contracts Management Division, EPA

Contract No. 68-02-2105, RFP No. Du-75-A089 .... *$281,920*

ESTABLISH OPERATING PROCEDURES FOR FINE PARTICLE CONTROL EQUIPMENT.

PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-2071, RFP No. Du-75-C177 .... *$104,225*

TESTING OF HYDROCARBON EMISSIONS FROM VEGETATION AND DEVELOPMENT OF A METHODOLOGY FOR ESTIMATING EMISSION RATES FROM FOLIAGE IN ANY GEOGRAPHICAL AREA IN THE UNITED STATES.

Washington State University, College of Engineering, Research Division, Pullman, Washington 99163

Contract No. 68-02-2085, RFP No. Du-75-C082 .... *$186,610*

ENGINEERING AND ECONOMIC STUDIES IN SUPPORT OF LEAD EMISSION REGULATIONS.

PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246
(NOTE: Contract contains options in the amount of $25,908)

Contract No. 68-02-1375, Task Order No. 24 .... *$99,359*

TECHNICAL ASSISTANCE TO THE STATE OF FLORIDA FOR AQMA DEVELOPMENT.

PEDCo Environmental Specialists, Inc., Suite 8, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-2048, RFP No. Du-75-C276 .... *$470,085*

A STUDY OF THE FORMATION AND TRANSPORT OF AMBIENT OXIDANTS IN THE WEST GULF COAST AND NORTH-CENTRAL AND NORTH-EAST REGIONS OF THE U. S.

Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-2113, RFP No. Du-75-A188 .... *$110,010*

A STUDY OF EMISSIONS FROM IRON ORE, MINING, BENEFICIATION, AND PELLETIZING.

Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110

Contract No. 68-02-2084, RFP No. Du-75-C320 .... *$71,833*

INVESTIGATE RELATION OF URBAN AND RURAL OXIDANT LEVELS TO METEOROLOGICAL FEATURES.

Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California 94025

Contract No. 68-02-2254, RFP No. Du-75-B240 .... *$17,500*
ANALYSES FOR HYDROCARBONS AND HALOCARBONS IN THE ST. LOUIS URBAN PLUME.
Washington State University, College of Engineering, Pullman, Washington 99163 (NOTE: Contract contains an estimated definitization of $35,000)

Contract No. 68-02-2076, RFP No. Du-75-C181 .... *$136,540*
GROWTH EFFECTS OF MAJOR LAND USE PROJECTS.
Walden Research Division of Abcor, Inc., 201 Vassar Street, Cambridge, Massachusetts 02139

Contract No. 68-02-2090, RFP No. Du-75-C223 .... *$49,400*
CONDUCT A CASE STUDY DEMONSTRATION OF THE APPLICATION OF A RELIABILITY ANALYSIS TECHNIQUE TO THE DEVELOPMENT AND UPGRADING OF A SUPPLEMENTARY CONTROL SYSTEM.
Environmental Research Technology, Inc., 696 Virginia Road, Concord, Massachusetts 01742

Contract No. 68-02-1477, Modification No. 4 .... *$58,490*
CONDUCT INDIVIDUAL POWER PLANT INSPECTIONS.
PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1343, Modification No. 8 .... *$39,746*
SUPPLEMENTAL FUNDING FOR FIELD MONITORING SERVICES.
PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-2075, RFP No. Du-75-C129 .... *$285,818*
AIR POLLUTION CONTROL ENGINEERING AND COST STUDY OF THE SURFACE COATING INDUSTRY.
DeBell and Richardson, Inc., Water Street-Hazardville, Enfield, Hartford County, Connecticut 06082 (NOTE: Contract contains options in the amount of $105,452)

Contract No. 68-02-2082, RFP No. Du-75-C197 .... *$218,204*
FURNISH ENGINEERING COST ESTIMATING AND ECONOMIC ANALYSIS SUPPORT FOR ITS REGULATORY PROGRAM.
Energy and Environmental Analysis, Inc., 1701 North Fort Myer Drive, Suite 1211, Arlington, Virginia 22209

Contract No. 68-02-2089, RFP No. Du-75-C339 .... *$15,612*
THE WORK SHALL CONSIST OF PROVIDING ALL NECESSARY MATERIALS, LABOR, AND SUPPLIES TO CONSTRUCT A SECOND FLOOR LEVEL IN ROOM G-212 AT THE NATIONAL ENVIRONMENTAL RESEARCH CENTER, RESEARCH TRIANGLE PARK, N. C., INCLUDING ELECTRICAL WORK, ACOUSTICAL CEILING, AND CHANGES IN AIR DUCTS.
C. A. Dayberry Building and Paint Contractors, Inc., 1107 Fuller Street, Raleigh, North Carolina 27603

Contract No. 68-02-1878, RFP No. Du-75-A010 .... *$99,482*
APPLICATION OF NEW CONCEPTS TO FINE PARTICLE CONTROL.
Donaldson Company, Inc., P. O. Box 1299, Minneapolis, Minnesota 55440

Contract No. 68-02-1879, RFP No. Du-75-A010 .... *$191,230*
APPLICATION OF NEW CONCEPTS TO FINE PARTICLE CONTROL.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-1887, RFP No. Du-75-A010 .... *$245,200*
APPLICATION OF NEW CONCEPTS TO FINE PARTICLE CONTROL.
Westinghouse Electric Corp., Beulah Road, Pittsburgh, Pennsylvania 15235

Contract No. 68-02-1751, Modification No. 2 .... *$85,945*
INHALATION OF TOXICOLOGY OF PESTICIDES.
Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California 94025

Contract No. 68-02-1687, Modification No. 3 .... *$53,492*
AN AMPHIHOLE MINERAL SAMPLE STUDY TO COMPLIMENT ONGOING STUDIES FOR PREPARATION AND CHARACTERIZATION OF FINELY PARTICULATE ENVIRONMENTAL CONTAMINATES FOR BIOLOGICAL EXPERIMENTATION.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

Contract No. 68-02-1380, Task Order No. 12 .... *$49,262*
ASSISTANCE TO SOUTH CAROLINA IN DEVELOPING AND TESTING CONTROL STRATEGIES FOR AQMA'S AND PREPARATION OF CONTROL STRATEGY SECTION OF AQMA PLANS.
Engineering Sciences, Inc., 7903 Westgate Park, McLean, Virginia 22101

Contract No. 68-02-1622, Modification No. 2 .... *$103,097*
EXTENSION OF CONTRACT FOR LIBRARY SERVICES.
The University of North Carolina, P. O. Box 2688, Chapel Hill, North Carolina 27514 (NOTE: Contract contains options)

Contract No. 68-02-2093, RFP No. Du-75-C379 .... *$4,646,054*
OPERATION OF THE REGIONAL AIR MONITORING SYSTEM (RAMS).
Rockwell International Corp., Science Center, P. O. Box 1085, Thousand Oaks, California 91360 (NOTE: Contract contains options in the amount of $3,159,966)

Contract No. 68-02-1383, Task Order No. 12 .... *$39,807*
UPDATE INVENTORY AND PROJECT EMISSIONS FOR AQMA ANALYSIS IN ARKANSAS.
Radian Corp., 8500 Shoal Creek Boulevard, Austin, Texas 78766

Contract No. 68-02-2048, Modification No. 1 .... *$22,040*
AIRBORNE SAMPLING FOR SULFATES AND NITRATES AND ATMOSPHERIC MONITORING OF OZONE.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, N. C. 27709

Contract No. 68-02-1375, Task Order No. 27 .... *$32,000*
TECHNICAL ASSISTANCE TO SUPPORT THE CINCINNATI SUMMER OZONE STUDY.
PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1687, Modification No. 5 .... *$49,700*
PREPARATION AND CHARACTERIZATION OF FINELY PARTICULATE ENVIRONMENTAL CONTAMINANTS FOR BIOLOGICAL EXPERIMENTATION.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

Contract No. 68-02-2266, RFP No. Du-75-B225 .... *$74,925*
ANALYSIS OF BLOOD, HAIR, URINE, AND DUST SAMPLES FOR HEAVY METALS.
Stewart Laboratories, Inc., 820 Tulip Avenue, Knoxville, Tennessee 37921

Contract No. 68-02-2236, RFP No. Du-75-B123 .... *$59,400*
SYNTHESIS OF UNLABELED AND RADIOLABELED COMPOUNDS OF ENVIRONMENTAL IMPORTANCE.
Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110

Contract No. 68-02-1377, Task Order No. 7 .... *$31,200*
INSTALLATION OF EIS/P&R, AQDES AND ATMOSPHERIC DIFFUSION MODELLING SOFTWARE FOR THE NORTH DAKOTA DIVISION OF ENVIRONMENTAL ENGINEERING.
Walden Research Division of Abcor, 201 Vassar Street, Cambridge, Massachusetts 02139

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1975

52043 **APTIC NO. 74731**

Barniske, Lothar

INCINERATORS IN THE FEDERAL REPUBLIC OF GERMANY AS OF 1975. *(Muellverbrennungsanlagen in der Bundesrepublik Deutschland). Text in German. Muell Abfall, 7(4):111-115, 1975. 4 refs.*

There are at present 31 incinerators for garbage and garbage-like wastes in operation in the Federal Republic of Germany. This number will have risen to 39 in 1977. With the exception of four incinerators all are equipped with electrostatic precipitators for waste gas cleaning, and four incinerators are equipped with additional gas scrubbers. Of the total population, roughly 13.4 million or about 21.7% have access to an incinerator. Nearly two-thirds of the incinerators in operation or under construction are designed for capacities of 30 tons/hr, i.e., for a popolatuion of 300,000 each. In these high-capacity incinerators heat is used for steam generation. In 21 of 28 plants, steam of 40-100 atm gauge, and 400 to 500 C is used for power generation, partially combined with remote heating. In the remaining 7 plants, steam of 15-20 atm gauge and 200 to 250 C is used for remote heating or industrial purposes.

52044 **APTIC NO. 74583**

Broemmel, Walter

FIRST EXPERIENCE OF OPERATING AN UP-TO-DATE HIGH DUTY COKE OVEN PLANT WITH CONTINUOUS COKE QUENCHING. *(Erste Erfahrungen beim Betrieb einer neuzeithlichen Hochleistungskokerei mit kontinuierlicher Koksloeschung). Text in German. Stahl Eisen (Duesseldorf), 95(8):335-338, 1975.*

Two flow-controlled coke-oven batteries with heating-flue groups have been operating since March and August 1973 respectively in the Osterfeld coke-oven plant of Ruhrkohle. They have performed well with 18-hr coking time at an average temperature of 1320 C. Proceeds for benzol increased, and a benzol recovery plant has been commissioned for underfiring gas. For reasons of emission protection, it was necessary to clean mechanically in addition to the chamber frame-, door-, and ascension-pipe cleaning facilities. There was high dust escape from the stacks of the continuous quenching plant.

52045 **APTIC NO. 74586**

Danchick, R. S. and J. R. Ryan

CAPTURE AND ANALYSIS OF GASEOUS FLUORIDE EMITTED FROM ALUMINUM REDUCTION CELLS. *Aluminium, 51(4):284-288, 1975. 4 refs.*

The development of an experimental instrument to monitor both low concentrations of fluoride in effluent gases from the Alcoa 398 fume recovery system and higher concentrations at the inlet of the Alcoa 398 process is described. Gaseous fluoride was removed from the effluent gas sample stream with a unique, continuous aerosol gas scrubber. A fluoride-selective electrode continuously measured the fluoride concentration in the scrubber solution with a permanent record obtained with a strip chart recorder. While testing the efficiency of the Alcoa 398 process, it was found that the gaseous fluoride content of the fluidized alumina bed varied over a large concentration range with time, increasing during crust breaking, anode setting, and metal tapping. The reserve capacity of the Alcoa 398 fume recovery system was able to accommodate large changes in load. Scrubbing efficiencies, the magnitude and duration of the concentration excursions, at the inlet of the Alcoa process, and specific implications for various dry scrubbing fume recovery systems are described.

52046 **APTIC NO. 74637**

Eberan-Eberhorst, R. and F. Moser

CO-EMISSIONS OF FOURSTROKE-OTTO-CYCLE ENGINES STRONGLY DEPEND ON ALTITUDE. *(Einfluss der Seehoehe auf die CO-Emission des Viertakt-Ottomotors). Text in German. Motortech. Z. (Stuttgart), 36(5):147-151, 1975. 8 refs.*

The investigation (theoretical and practical) of the influence of altitude on carbon monoxide emissions on the Grossglockner Road up to 2500 m, in order to devise road tunnel ventilation systems for high altitudes is described. The CO concentration per 1000 m elevation increased about 2.1%, higher than the theoretical estimation. Engines with fuel injection, depending on inlet manifold pressure, showed no altitude influence. The 2.1% volume CO increase per 1000 m was used to establish the CO concentrations at higher levels.

52047 **APTIC NO. 74827**

Goto, Hideaki, Tatsunori Oyake, and Motoi Kamada

ON THE EMISSION FACTOR OF SOX IN THE EXHAUST GASES FROM STATIONARY SOURCE. *(Kotei hasseigen ni okeru SOx haishutsu keisu ni tsuite). Text in Japanese. Hokkaido Kogai Boshi Kenkyusho Ho (Rep. Hokkaido Res. Inst. Environ. Pollut.), no. 1:75-78, March 1975. 6 refs.*

Sulfur oxide emission factors were calculated for heavy oil boilers used in power plants, heating installations, and black solution combustion. The flue gas sampled with a stainless steel pipe (6 mm in diameter) packed with 1 g of silica wool at one end. The samples were analyzed by the arusenazo III method and the barium chloranilate method after metals were removed with ion exchange resins. The SOx emission factors were calculated from the SOx emission, fuel consumption and sulfur content. The average SOx emission factor was 19.5 kg (SO2)/kl S% for 15 power plant boilers, 31.8 kg(SO2)/kg S% for four heating boilers, and 2.4 kg(SO2)/kl S% for seven black solution combustion boilers. The best results were obtained for power plant boilers due to the accurate fuel consumption estimation.

52048 **APTIC NO. 74700**

Higashida, Toshio

CHARACTERISTICS OF MODERN ENVIRONMENTAL PROBLEMS. *(Gendai kankyo mondai no tokushitsu). Text in Japanese. Koshu Eisei (Public Health), 39(3):131-139, March 1975.*

Pollution problems in Japan, caused by continuing industrial expansion, an increase in the number of motor vehicles, and insufficient quality control of food and drug processing, are discussed. According to the Japanese Environmental Agency, industrial construction has altered 21% of the Japanese coastline: Tokyo Bay (80%); Osaka Bay (73%); Dokai Bay (56%);

Preceding page blank

Mutsu Bay (54%); Ise Bay (49%); Hiuchi Bay (48%); and Suo Sea (44%). Of the total land area, only 22.8% has been maintained in a natural state. Unwitting victims of toxic contaminants in food (Morinaga milk poisoning, the Kanemi oil syndrome) have served as warnings of deficiencies in food processing. Inadequate control of drug manufacturing and marketing practices (Thalidomide, Quinoform, Coraldil) is described. Compensation for these pollution victims is described as being insufficient, even when judgment favorable to the victims had been handed down. Problems of noise and vibration pollution are caused by public works projects (high-speed highways, airports). Citizen involvement is necessary for initiating and maintaining environmental conservation and pollution countermeasures.

52049 **APTIC NO. 74559**

Hiramatsu, Kinji

THERMALLY CRACKED GAS PRODUCTS OF POWDER PAINTS. *(Funtai toryo no netsu bunkai seisei gasu). Text in Japanese. Preprint, Osaka Prefectural Industrial Research Inst., Japan, p. 3-4, 1975. (Presented at the Osaka Prefectural Industrial Research Institute Meeting, Osaka, Japan, June 15, 1975, Paper I-2.)*

Thermal decomposition products of three different powder paints (acrylic resin, epoxy resin, and polyester resin) were analyzed by mass spectrometry. Each powder paint was placed in a tube which was heated by an electric furnace for 20 min at 220 C, and the mass spectra of the resultant gas phase were then taken. The spectra of the gas phase products from acrylic resin paint showed the presence of styrene, butyl acrylate, isobutyl methacrylate, isopropyl benzene, ethyl benzene, toluene, isobutanol, and normal-butanol. The generated gases from acrylic resin paint were cooled by dry ice before taking their mass spectra; and the cooled gas phase did not indicate any peak on the mass spectra, indicating that carbon monoxide and hydrocarbons in low molecular weight wer not present. The spectra for the epoxy resin paint indicated the presence of xylene, butyl acrylate, n-butanol, carbon dioxide, ammonia, water, and trace hydrocarbons with less than three carbon atoms. The polyester resin paint gave the same gas phase products as the epoxy resin paint; however, trace hydrocarbons with less than five carbon atoms were observed. The generated gas per unit weight of paint was determined by the increased pressure within the reaction tube upon heating. It was 1.1 ml/g, 3.1 ml/g, and 3.4 ml/g for the acrylic resin, epoxy resin, and polyester resin paint, respectively.

52050 **APTIC NO. 74916**

Hiroyasu, Hiroyuki, Toshiichi Kakuda, Shinji Ikura, and Mitsuru Shoda

SIMULATION OF COMBUSTION AND EXHAUST GAS OF DIESEL ENGINES. II. COMPARISON BETWEEN THE RESULTS OF CALCULATION AND EXPERIMENT. *(Diesel kikan no nensho to haiki simulation. II. Keisan kekka oyobi jikken kekka to no hikaku). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 25-33, 1975. 27 refs. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

Simulation calculations of diesel engine combustion and exhaust gas were compared with experimental data. A direct injection diesel engine was used. The compression ratio was 15.5. The pressure in the cylinder was measured with a resistance wire strain gauge. Measurements of the concentrations of nitric oxide, carbon monoxide, and black smoke were made under various conditions of operation. The sprayed fuel widened with time. With the spreading, the temperature of the fuel drops rose, accompanied by the evaporation of the fuel. The spray ignited when a definite critical condition was reached. With ignition, a rapid expansion occurred and much air became mixed with the fuel gas. The change of pressure in the cylinder was calculated as a function of the crank angle and was compared with the experimental data. The concentrations of NO, CO, and black smoke were also calculated as a function of the time of spraying and were compared with the experimental data. The agreement was quite satisfactory. Advancing the time of injection caused the pressure in the cylinder to rise and the NO concentration rapidly increased. However, the amount of black smoke remained unchanged. An increase in the rate of revolution increased the maximum pressure but lowered both the NO and black smoke concentration. The effect of the amount of spraying was also examined.

52051 **APTIC NO. 74924**

Hiroyasu, Hiroyuki

STUDY ON FORECASTING OF NOX AND SMOKE GENERATED FROM SPRAY INCINERATOR. *(Funmu nenshoro kara hasseisuru NOx ryo oyobi baienryo no yosoku ni kansuru kenkyu). Text in Japanese. Preprint, National Univ., Kagawa (Japan), Joint Research Group in Chugoku and Shikoku, p. 68-72, 1975. 15 refs. (Presented at the Symposium on Basic Studies on Improvement of Inland Sea Environment, National University Lecture Meeting, 4th, Kagawa, Japan, May 21-22, 1975.)*

A method of predicting the nitrogen oxide and smoke emissions generated by a spray incinerator is discussed. An attempt is made at making a model for combustion inside a furnace to arrive at emission coefficients and to clarify the generation of pollutants. Based upon the behavior of single drop of spray the basic constituents of the spray, and the dispersion of the spray, analytical models to calculate the formation of spray, evaporation, ignition, thermal generation, local temperature history, and local oxygen concentration are developed and used to calculate the volume of nitrogen oxide and smoke generated by a furnace. With more data on spray flow and the combustion gas, it appears possible to forecast the NOx and smoke generation at the time of spray combustion (liquid fuel). By applying this method to various types of furnaces, emission coefficients of pollutants from stationary sources can be sought; and the effects of control measures can be estimated.

52052 **APTIC NO. 76732**

Hiruma, Masaru, Shoichi Furhama, and Ichiro Shinkei

MEASUREMENT OF THE LUBRICATING OIL CONSUMPTION ON A HYDROGEN ENGINE. *(Suiso engine o shiyo shite no junkatsuyu shohi no sokutei.) Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 144-146, 1975. 3 refs. (Presented at the Japan Society of Automotive Engineers, Science Lecture Meeting, Tokyo, Japan May 13-15, 1975.)*

Hydrocarbons, carbon dioxide, and carbon monoxide present in the gas discharged from a hydrogen engine originate in the lubricating oil. Therefore, the consumption rate of lubricating oil is easily measured if the HC and CO present in the discharged gas are made to burn completely. The continuous measurement of the discharged CO2 gives the state of combustion of lubricating oils. The sampling of discharged gas was made through a copper tube at 20 cm from the exhaust valve of a hydrogen engine. The collection was made at a rate of 5 l/min. This sample was passed through a layer of granular platinum catalyst heated to 555-650 C. Then all HC and CO were converted to CO2. The determination of CO2 was made with an infrared gas analyzer. The delay time in measurement was about 15 sec. The consumption of lubricating oil increased with boost pressure increases; load and rate of revolution increase, cylinder temperature decreases, ignition timing advances, and viscosity increases.

52053 **APTIC NO. 74404**

Ishiguro, T.

ON THE APPRAISAL OF COMPOUND OFFENSIVE ODOR. *(Fukugo akushu no hyoka ni kansuru kenkyu kara). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(6):58-59, June 1975.*

Malodorous gas samples collected at the rendering plant, feather meal plant, fish meal plant, sewage treatment plant, night-soil treatment plant, food processing plant (coffee mill and brewery), animal farm, and kraft pulp mill were analyzed. Malodorant concentrations in the original sample, the ammonia fraction obtained using sulfuric acid filter, and the hydrogen sulfide fraction obtained using lead oxide filter were ND-36.2 ppm for NH3, ND-1.43 ppm for H2S, ND-17.3 ppm for methyl mercaptan, and NF-80.4 ppm for dimethylsulfide. The odor intensity and discomfort index were also measured, and the correlation between malodorant concentration and odor intensity or discomfort index was analyzed. The malodorant concentration did not correspond to the odor intensity or discomfort index in many cases. The problems involved in the sampling method and analysis method are discussed.

52054 **APTIC NO. 74820**

Ito, Masatoshi, Yoshio Kitagawa, and Hiroshi Ryomi

INVESTIGATION RESULT ON THE SOOT AND SMOKE AT THE ELECTRODE MANUFACTURING PLANT. *(Denkyoku seizo kojo ni okeru baien chosa seiseki ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:97-99, March 1975.*

The sulfur dioxide, soot, and smoke emissions from a carbon electrode manufacturing plant were determined. The average amount of soot dust in the stack gas from a baking furnace was 67 mg/normal cu m; 7 mg/normal cu m were tar-like dusts. The soot level emission from a tunnel furnace was 76 mg/normal cu m; 2 mg/normal cu m were tar-like dusts. No appreciable levels of lead, copper, cadmium, or cobalt were detected in the soot dusts; however, 0.06 and 0.22 mg/normal cu m iron were found in the soot dust from a baking furnace and tunnel furnace, respectively. Appreciable levels of lead, nickel, and chromium were also found in the dust from the tunnel furnace, but they were not found in dusts from the baking furnace. The stack gas SO2 levels for the baking and tunnel furnaces were 5.4 ppm and 2.9 ppm, respectively. The airborne dust levels within the plant area was also measured, and its average amount was 69 microgram/cu m. Airborne dust levels for surrounding areas of the plant ranged from 61 to 45 micrograms/cu m and were well below the environmental standard for airborne dusts of 100 micrograms/cu m.

52055 **APTIC NO. 74788**

Iwahoto, K.

QUESTIONS IF AUTOMOBILE IS NOT RESPONSIBLE FOR NOX POLLUTION. *(NOx no genkyo wa kuruma dewa nai). Text in Japanese. Mota Fan (Motor Fan), no. 365:173-181, May 1975.*

The claim that automobiles are solely responsible for photochemical smog formation in the Tokyo area was rebutted. The industrial complex in the Tokyo gulf area was the major contributor to the photochemical smog incidents in Tokyo from 1970. Three lines were drawn on the map, the first line extending from the Kawasaki industrial area to the northwest, the second line to the north, and the third line to the northwest west. The first line passed Rissei High School, Omori First Junior High School, Taishido Junior High School, and Isahikamii Minami Junior High School who became nationally known because of photochemical injuries to students. The 2nd line passed Aoyagi kindergarten and the Ikebuburo Junior High School, and the 3rd line passed Hachioji city, where photochemical injuries were significant. Photochemical injuries in these area mostly occurred with SE or ESE wind which brought in the air pollutants from the Kawasaki industrial complex area.

52056 **APTIC NO. 74638**

Jost, Dieter and Werner Rudolf

NO/NO2-CONCENTRATIONS IN THE FEDERAL REPUBLIC OF GERMANY. *(NO/NO2-Konzentrationen in der Bundesrepublik Deutschland). Text in German. Staub, Reinhaltung Luft, 35(4):150-154, 1975. 31 refs.*

Studies of long duration on the concentration of mixtures of nitric oxide and nitrogen dioxide have shown an increasing trend. Maximum allowable concentrations have been reached in areas where there is a great deal of traffic. Test results depended greatly on the location of the test. As has been assessed from measurements carried out on Sundays, when there is no traffic, the amount of NO and NO2 immissions contributed by the traffic of downtown districts was about 40 to 50%. The average residence time of NO2 in the free atmosphere was about four days.

52057 **APTIC NO. 76740**

Kalman, Simon

SOME GENERAL LAWS OF EVOLUTION IN MINING ENERGY CARRIERS. *(A fejlodes nehany altalanos torvenyszerusegenek ervenyesulese az energiahordozok banyaszataban). Text in Hungarian. Banyasz. Kohasz. Lapok, Banyaszat, 108(1 and 2):19-32, Jan.-Feb. 1975. 31 refs.*

The evolution of the availability and utilization of fossil and other energy carriers on a worldwide basis is outlined. Energy carrier resources are evaluated with respect to future technological and economic threholds of utilization or extraction. The quantitative growth of the energy production also entails qualitative changes in the composition of energy sources. The trend is clearly toward energy carriers with increased specific energy content, such as nuclear and fusion fuels. Solar energy represents a major source of energy in the future. The utilization of deuterium, extracted from ocean water, appears capable of solving all energy problems. The extraction of mineral fuels is expected to increase during the rest of this century in absolute terms. Hydrocarbon resources are expected to be depleted before coal resources. Both conventional nuclear reactors and breeder reactors constitute a temperary solution to the energy problem, while fusion energy utilization is anticipated between 2000 and 2100.

52058 **APTIC NO. 74994**

Kato, Tatsuo, Shinji Nakayama, and Masako Ouchi

AUTOMOBILE EXHAUST GAS POLLUTION IN TUNNELS. *(Tonneru nai no jidosha haiki gasu osen). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, p. 50-51, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Carbon monoxide concentrations were determined within and near the entrances to the Yamate Tunnel in Yokohama City, Japan. Yamate Tunnel is 270 m long, 11.5 m wide, with single lane traffic in each direction, and pedestrian walks on both sides of the traffic lanes. Sampling was conducted on a windless day in July 1973, during a 15-minute period, at 93 locations. Air samples were collected in 5-ml polyethylene syringes at a rate of 1 ml/10 sec. Analysis was conducted by gas chromatography. At the entrances to the tunnel, carbon monoxide concentrations were about 30 ppm. Concentrations near the center of the tunnel reached maxima of 80 and 110 ppm, depending on the traffic direction. Concentrations correlated with traffic count. Locations of the maxima within the tunnel shifted with direction of traffic motion, toward the rear of the traffic movement.

52059 **APTIC NO. 74343**

Kitagawa, Yoshio, Masatoshi Ito, Akio Sueda, and Hiroshi Ryomi

INVESTIGATION REPORT ON THE TOXIC SUBSTANCES OF INDUSTRIAL WASTE MANAGEMENT PLANT. *(Sangyo haikibutsu shori kojo no yugai bushitsu chosa seiseki ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Annu. Rept. Yamaguchi Prefect. Inst. Health), no. 16:94-97, March 1975.*

The flue gas emitted from an industrial waste incinerator at Onoda, Japan was investigated for hydrogen chloride, sulfur dioxide, nitrogen oxides, hydrogen cyanide, and soot. The flue gas contents varied with the type of wastes incinerated. The average HCl concentration in the gas was 212 ppm with a maximum of 647 ppm during the incineration of benzene hexachloride waste; these levels exceeded the HCl emission standard of 50 ppm. The SO2 concentration of the stack gas ranged from 53 to 25 ppm, and the average NOx level was 22 ppm. The HCN level was 0.75 ppm during the incineration of acrylonitrile-butadiene-styrene resin waste. The average amount of soot was 0.44 g/normal cu m which was below the emission standard of 0.70 g/normal cu m. The metal composition of the soot varied with the type of waste incinerated; average levels of 7.7, 5.2, 0.47, 0.17, 0.13, 0.09, 0.02, and 0.02 mg/normal cu m flue gas were observed for iron, lead, copper, chromium, manganese, nickel, cobalt, and cadmium, respectively.

52060 **APTIC NO. 74889**

Kobayashi, Yoshitaka, Masahiro Hori, Takayoshi Nomura, and Kenzaburo Tsuchiya

HYGIENIC EVALUATION OF LEAD IN ENVIRONMENT; AMOUNT OF WATER SOLUBLE LEAD COMPONENT IN SUSPENDED PARTICLES AND SOIL SAMPLES. *(Kankyo en no eisei kagakuteki hyoka; taiki, sagyokanki oyobi dojochu namari no suiyosei). Text in Japanese. Preprint, Japan Assoc. of Industrial Health and Japan Council of Industrial Physicians, Tokyo, p. 458, 1975. (Presented at the Japan Association of Industrial Health, 48th, and 18th Japan Council of Industrial Physicians, Ordinary Meeting, Sapporo, Japan, July 15-17, 1975, Paper 526.)*

Quantitative analysis by polarography of water soluble lead components in airborne particulates and soil is described. The airborne particulates were collected using a high volume air sampler at two locations near a road in Yokohama with traffic of about 40,000 automobiles/day. One location was next to the road and the other was on a building top (15 m height) located 100 m from the road. The collected particulates were dissolved in water or in hydrochloric acid solution which was then analyzed. The amount of dissolved lead component increased with increased solution time, and 30 min duration gave the peak dissolution. The average lead concentration found in the sample air was 0.35 micrograms/cu m of which the water soluble lead concentration was 0.15 microgram/cu m (41.0%). The samples collected next to the road contained more water soluble lead component than the sampels collected at the building top. Air samples from factories treating lead compounds were also analyzed. These factories processed either lead chromate or metallic lead, and their indoor atmosphere contained less water soluble lead in the suspended particles collected, but it varied with the types of lead processed in the factories. Those factories using lead chromate showed an average of 2.2% of water soluble lead in the suspended lead particles, and those factories using metallic lead showed an average of 26.3% soluble lead. The soil samples in the Yokohama area were also analyzed, but the water soluble lead component was very small and it was less than 1% of the total lead concentration in the soil.

52061 **APTIC NO. 74502**

Kurosawa, Keiji

CHEMICAL INDUSTRY AND ENERGY CONSERVATION. *(Kagaku kogyo to sho enerugi). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(1):9-15, Jan. 1975.*

The course of Japanese industry which depends heavily on imported energy sources and raw materials is discussed in terms of the availability and limit in importation. The pollution countermeasures and energy conservation policy published in Chemocology by the U. S. Manufacturing Chemists Association emphasizes the recycling of heat energy. The pollution control technology in Japan is evaluated from the standpoint of energy conservation. The efficiency of desulfurization methods evaluated in terms of effective energy or productivity indicated that stack gas desulfurization was more efficient than heavy oil desulfurization. Denitrification by modified combustion methods and flue gas denitrification are similarly evaluated. The treatment methods for waste water and refuse are also reviewed from the standpoint of energy conservation. The energy consumed by chemical industries in 1972 was 24,000 million kWh of electricity (6% of total electric power consumption) and 5.5 million kl of heavy oil (2% of total heavy oil consumption). Energy conservation in the chemical industry is discussed with examples from the electrolytic soda industry and petrochemicals.

52062 **APTIC NO. 74763**

Luetzke, Klaus

EMISSIONS OF NITROGEN OXIDES FROM FIRING SYSTEMS (INDUSTRY, HOUSEHOLD). *(Emissionen von Stickstoffoxiden aus Feuerungsanlagen (Industrie, Haushalt). Text in German. Staub, Reinhaltung Luft, 35(4):127-134, 1975. 10 refs.*

Measurements of nitric oxide emitted from domestic and industrial firing installations have shown that its content in the flue gas differed according to the firing conditions. This is because the formation of nitric oxide depends on parameters such as the combustion chamber temperature, oxygen partial pressure, residence time, and development of combustion. The content of nitric oxide (with respect to air-free and dry waste gas) reached, according to process conditions, from an average of 100 ppm in the case of domestic firing to a maximum of 5000 ppm for industrial firing with high regenerative air preheating. The effect of a partial-load operation on the emission of nitric oxide was investigated in various installations. The amount of nitrigon dioxide in mixtures of nitric oxide and nitrogen dioxide was lower than 7% in all industrial firing installations operating at a maximum load. In the partial-load operation, this amount increased in a single case up to 15%.

52063 **APTIC NO. 74689**

Makihara, M.

CONTROL OF AIR POLLUTANTS IN MIZUSHIMA AREA. *(Mizushima chiiki ni okeru taiki osen bushitsu no soryo kisei ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(4):303-307, 1975. 2 refs.*

The overall allowable emission of sulfur oxides in Okayama was set at 2398 N cu m/hr including 2200 N cu m/hr at the sea bank industrial area. The level was to be accomplished in 1977. The 2200 N cu m/hr allowable emission at the sea bank industrial area was determined based on the emissions from 2 steel plants, 2 power plants, 2 petroleum refineries, 1 industrial waste treatment plant, and 27 other plants. The total number of facilities subject to desulfurization were expected to increase from 14 in 1974 to 36 in 1977, and the total volume of desulfurized flue gases would increase from 1,835,000 to 9,169,790 N cu m/hr during the same period of time. The overall allowable emission of nitrogen oxides for the sea bank industrial area was set at 2000 N cu m/hr to be accomplished in 1978. The number of facilities subject to denitration were expected to be 87 in 1978. The total volume of treated flue gases would exceed 18 million N cu m/hr in the same year.

52064 **APTIC NO. 74360**

Masek, V.

EFFECTS OF VAPORS FROM THE COKE WET QUENCHING PROCESS. *(Einwirkungen der Dampfschwaden aus dem Koksnassloeschverfahren). Text in German. Zbl. Arbeitsmed., 25(4):102-106, 1975.*

Emissions from coke quenching with and without pressure were examined over a period of 9888 hr at six points inside the quenching tower and at four points on the windward and leeward sides (outside) of the tower for numerous metal samples, with and without surface protection, and for four kinds of plastics. In a tower with pressureless quenching, the quantity of emitted substances, as well as the damage of the samples, was greater than in a tower with pressure quenching. In the vicinity of both towers the damage of the samples was far lower than inside the towers but was three to four times greater than in the heavily polluted vicinity of chemical plants. The quantity of solid components greatly influenced the extent of samples damaged. The vapors from the wet quenching process were extremely aggressive inside the towers. In the immediate neighborhood, the intensity of damage to most metal samples dropped roughly with the second power of the distance. On the windward side damage was less pronounced than on the leeward side.

52065 **APTIC NO. 76737**

Miyabe, Hideya, Susumu Sato, and Takeo Oyama

THE EFFECT OF THE SHAPE OF THE COMBUSTION CHAMBER ON THE COMBUSTION CHARACTERISTICS OF TWO STROKE ENGINES. *(2 Saikuru kikan no nensho tokusei ni oyobosu nenshoshitsu keijono eikyo). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 123-131, 1975. 2 refs. (Presented at the Japan Society of Automotive Engineers, Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

The effect of combustion chamber shape on the combustion efficiency of two-stroke engines was investigated. Combustion characteristics were compared between semispherical and wedge type combustion chambers. The gas sweep characteristics as expressed by the gas supply efficiency was better in the wedge type than in the semispherical type. The flame propagation rate of the wedge type varied little with the change of direction, but that of the semispherical type varied to a large extent. The maximum combustion pressure was found at an air-fuel ratio of 12-13, irrespective of the air supply ratio. The maximum combustion pressure of the wedge type was considerably lower than that of the semispherical type. The temperature of the exhaust gas, combustion variation, and the effect of combustion characteristics on the discharged gas were also investigated.

52066 **APTIC NO. 74805**

Miyaki, Kiyoshi and Akira Okubo

INTERNAL COMBUSTION ENGINE. *(Nainen kikan). Text in Japanese. (Honda Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-12530. 2p., May 13, 1975. (Appl. May 8, 1972, 1 claim).*

An internal combustion engine for low cost fuel with low volatility was designed. The engine consists of a main combustion chamber with the main intake valve and fuel injection nozzle connected to a second fuel supply system which injects fuel with low volatility and an auxiliary combustion chamber with an auxiliary intake valve connected to the first fuel supply system with a carburetor which supplies fuel with high volatility. Two combustion chambers are connected by a conduit. During the intake stroke, a gaseous mixture with high fuel-air ratio is injected into the auxiliary combustion chamber, while the air is injected into the main combustion chamber. At the end of intake stroke, the fuel with low volatility is injected into the main combustion chamber. At the end of compression stroke, the fuel-air mixture in the auxiliary chamber is ignited and the flame is shot into the main combustion chamber, igniting the unvaporized fuel in the fuel receptacle located on top of the piston head.

52067 **APTIC NO. 74995**

Moore, John W. and Elizabeth A. Moore

RESOURCES IN ENVIRONMENTAL CHEMISTRY. AN ANNOTATED BIBLIOGRAPHY OF ENERGY AND ENERGY-RELATED TOPICS. *J. Chem. Educ., 52(5): 288-295, May 1975. 248 refs.*

An annotated bibliography containing approximately 250 entries on environmental and energy-related topics is presented. Sources for books, documents, periodicals, films, computer simulations, and literature searchers are provided covering such areas as coal mining and its environmental effects, acid mine drainage, gasification and related developments in coal research, the role of power plants in the direct production of air pollutants, the environmental effects of waste heat, sources and supplies of petroleum and natural gas, nuclear energy power production, alternative sources of energy for power generation and transportation, and energy storage and conversion.

52068 **APTIC NO. 74818**

Nakano, Nobuhiko

HYDROCARBON ANALYSIS IN AUTOMOBILE EXHAUST. *(Jidosha haigasu no tankasuiso no bunseki). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(2):119-123, 1975.*

The conventional techniques of hydrocarbon analysis of automobile exhaust gas are outlined. Methods of sample gas collection such as the low temperature condensation method, the IITRI method, the condensation method by gas chromatograph filler, and the collection of diluted gas sample are described. The chemical analysis of hydrocarbons can be carried out by gas chromatography.

52069 **APTIC NO. 74707**

Oka, Monoru and Yuji Haga

TEST AND RESEARCH FACILITIES FOR EXHAUST GASES AND ENGINE. *(Haigasu to enjin shiken kenkyu shisetsu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(5):453, 1975.*

The testing facilities for engine performance of the Hino Automobile Industrial Co. (which manufactures diesel trucks) are described. The total area of the testing facilities is 20,000 sq m which is divided into four main experimental sections; mechanical testing, exhaust gas and noise testing, basic engine testing, and weather testing. All sections perform a simulation of diesel truck running operation to collect exhaust gas emission and noise pollution data.

52070 **APTIC NO. 76734**

Omotehara, Yasuo, Hiroshi Tomoto, Kaoru Sato, Fumio Tsujimoto, Isao Nagaishi, and Tadahiro Azuma

DEVELOPMENT OF LOW NOX BURNER. *(Tei NOx bana no kaihatsu). Text in Japanese. Kogai (Kakua Shobo) (Pollution control), 10(3):127-142, May 1975. 6 refs.*

A 1 by 1 by 2 m iron furnace with refractories in the interior was used to study the nitric oxide concentration profile of a gun-type oil burner. A-heavy oil was burned at 21.6 l/hr with a flame length of about 70 cm at an air ratio of 1.15. Nitrogen oxides, carbon monoxide carbon dioxide and oxygen were analyzed by chemiluminescence and potentiometric methods or by an Orsat gas analyzer. Flame and exhaust gas temperatures were measured by a platinum-platinum/rhodium thermocouple. The high temperature region was 22-48 cm from the burner tip. The region coincided with the high nitrogen oxide concentration region. Controlling the flame temperature was more effective for NO prevention than was the reduction of oxygen two-stage combustion type and the flame division type were developed by trial and error. A burner greatly divided a flat flame was found to reduce the NO concentration from 150 ppm for a conventional burner to about 50 ppm.

52071 **APTIC NO. /4938**

Rasch, Rudolf

PROBLEMS OF HIGH-TEMPERATURE WASTE TREATMENT. *(Problematik der Hochtemperatur-Abfallbehandlung). Text in German. Chemiker-Ztg. (Heidelberg), 99(5):226-231, May 1975. 41 refs.*

Early processes for the treatment of refuse with liquid slag are reviewed. The following high-temperature processes, which are currently being developed, are reviewed: high-temperature combustion (Andco,Torrax, ATI, Union Carbide); thermoelectrical treatment of refuse (FLK and Steen). The problems of the vaporization of solids, and the treatment of waste water from the scrubbing of the gas are discussed.

52072 **APTIC NO. 74708**

Sasaki, Shozo

EMISSION CONTROL EXPERIMENTAL LABORATORY IN NO 7 ENGINEERING BUILDING. *(Honsha gijutsu 7 gokan no haiki jikken shitsu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(5):430, 1975.*

The emission control experimental laboratory of the Toyota Automobile Co. is explained. The laboratory consists of 8 chassis-dynamometer labs, 8 data measurement and processing rooms, one evaporating emission lab, and a car soaking room. Each chassis-dynamometer can simulate 140 km/hr of automobile running speed and 22 m/sec wind velocity. All of the experimental data are collected and analyzed in the data measurement and processing rooms using a computer. On-line operation is made within these laboratories.

52073 **APTIC NO. 74357**

Schilling, Hans-Dieter

GAS PLASMAS AS WORKING MEDIA FOR THE GENERATION OF ELECTRIC POWER: MAGNETOHYDRODYNAMIC ENERGY CONVERSION. *(Gasplasmen als Arbeitsmedien zur Erzeugung elektrischer Energie: Magnetohydrodynamische Energiewandlung). Text in German. Chemiker-Ztg. (Heidelberg), 99(6):265-271, 1975. 6 refs.*

The application of gas plasmas as working fluids for the direct conversion of heat into electrical energy is discussed. The prerequisite for magnetohydrodynamic energy conversion is a sufficiently high electric conductivity which requires a temperature of 3000 K for gaseous media and the presence of easily ionizable substances. The combination of an MHD generator with a steam power plant results in an efficiency of more than 50%. Difficulties concerning suitable materials must still be overcome for the process to become a reality. Pollutant emissions are considerably lowered as a consequence of the process s high efficiency.

52074 **APTIC NO. 74359**

Schwarzbach, Eberhard

DEVELOPMENT OF OXIDES OF NITROGEN IN NATURAL GAS FIRING SYSTEMS. *(Zur Frage der Entstehung von Stickstoffoxiden bei Erdgasfeuerungen). Text in German. Staub. Reinhaltung Luft, 35(4):134-136, April 1975. 10 refs.*

Nitrogen oxides originate inevitably in gas flames, i.e., when natural gas or propane/butane is burnt. Orientating measurements of the emissions of a household gas apparatus revealed that small burners set free higher concentrations when natural gas was used instead of city gas/long-distance gas. The concentrations of nitrogen oxides determined in kitchens can rise to, in the case of bad ventilation, undue values. Therefore, the exhaust gas should be diverted safely from the range of human activities. Disquieting is the trend to reduce the chimney heights for medium-sized natural gas heating installations to the dwelling level.

52075 **APTIC NO. 74579**

Stauff, Joachim and Hartmut Fuhr

CHEMILUMINESCENCE OF INTERNAL COMBUSTION ENGINE EXHAUST GASES. *(Chemilumineszenz der Abgase einer Verbrennungskraftmaschine). Text in German. Angew. Chem., 87(4):132, Feb. 1975. 4 refs.*

The chemiluminescence of exhaust gases from a spark ignition engine operated on regular gasoline was studied. The luminescence was observed perpendicular to the exhaust gas flow in a pyrex tube by means of a red-sensitive photomultiplier. Weak luminescence appeared after the start of the engine, and the luminescence intensity increased first exponentially and then at a decreasing rate with engine load increase. The attenuation constant after engine shutoff was about 0.001/sec, corresponding to 16 min. The attenuation curve followed first-order kinetics. Scavenging the pyrex tube with oxygen or nitrogen had no effect on the luminescence. Investigations of the soot and tar particles separated by chemiluminescence analysis alone and in 9,10-diphenylanthracene with dibutylphthalate, in chlorophyll with dibutylphthalate, and in rubrene with benzene showed that the energy-rich chemiluminescent substances are components of the soot and tar fraction. The findings are of importance in view to the increased carcinogenicity of electronically exicted molecules.

52076 **APTIC NO. 74566**

Tate, M.

BAD SMELL PROBLEMS IN GIFU PREFECTURE. *(Gifu ken no akushu mondai ni tsuite). Text in Japanese. Akushu Kenkyu (J. Odor Control), 4(19):1-2, March 1975.*

Odor problems in Gifu Prefecture are discussed. Animal husbandry is very important in Gifu Prefecture, and the prevention of odors is one of the most important problems in this prefecture. According to the Environment Agency of Japan, claims against odors account for as much as 24.6% of all claims against environmental pollution. Claims against odors are increasing, particularly in cities and towns with populations less than 250,000. Odor complaints increased as much as 92% in 1973 versus 1972.

52077 **APTIC NO. 74779**

Ueda, Atsujiro

TRAFFIC VOLUME AND ATMOSPHERIC CONCENTRATION OF NITROGEN OXIDES. *(Jidosha kotsu ryo to taiki chu NO2 nodo ni tsuite). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo (Japan), p. 288-289. 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

An investigation of nitrogen oxides of concentration was carried out in August and December of 1974 at a busy street in the Naka Ochiai Area. Traffic number was obtained by counting automobiles stopping on the red signal (45 sec) at an intersection. The nitrogen dioxide concentrations at 1 m and 2 m above ground on the street and sidewalk were measured by a simple Motoya method using triethanolamine. The NO2 concentration depended greatly on traffic number and, except for national holidays, the hourly average concentration of NO2 for 24 hr easily exceeded 0.1 ppm. High NOx concentration was observed at locations where automobiles passed immediately after starting.

52078 **APTIC NO. 76709**

Vuk, C. T. and J. H. Johnson

MEASUREMENT AND ANALYSIS OF PARTICLES EMITTED FROM A DIESEL COMBUSTION PROCESS. *Preprint, Combustion Inst., Pittsburgh, Pa., Environmental Protection Agency Grant 802596, 41p., 1975. 18 refs. (Presented at the Combustion Institute Central States-Western States Spring Technical Meeting, San Antonio, Tex., April 20-21, 1975.)*

An inertial impactor was used to collect and size particles from diesel engine exhaust under four engine operating conditions to assess the effect of exhaust temperature and engine speed on the nature of the particles. Both scanning and electron microscopes were used to analyze the particles collected. Diesel particles consisted of very small individual particles (about 450 A) which agglomerated to form particles as large as several micron. The individual particles were very similar to those observed in other types of diffusion flames. The chain-like structure of the agglomerates indicated that the agglomeration process was possibly related to electrical charges on the individual particles. Particle fusion also occurred in the exhaust system, indicating that particle interactions were still occurring at relatively low temperatures. Particles emitted at light engine loads were drastically changed due to the presence of organic matter. Slightly increased concentrations of sulfur were also observed in particles collected at lower temperatures. (Author abstract modified)

52079 **APTIC NO. 76655**

Weber, Ekkehard, Hans May and Helmut Buettner

EMISSIONS FROM DOMESTIC HEATERS FIRED WITH SOFT COAL BRIQUETS. *(Emissionen von braunkohlenbrikettegefeuerten Haushaltsoefen). Text in German. Staub, Reinhaltung Luft, 35(3):82-86, 1975. 12 refs.*

The environmental protection laws of the Federal Republic of Germany regarding lignite briquet as a fuel emitting little smoke or solid material are described. Other pollutants are dealt with quantitatively, e.g., the combustion of lignite fuel in domestic fireplaces. Experiments were performed using commercial domestic fireplaces imitating common firing conditions.

52080 **APTIC NO. 74652**

Welger, Klaus, Klaus Janeczek, Hans-Joachim Haase, and Friedhelm Syring

EXHAUST GAS TURBIDITY TESTS ON THE HIGHLY CHARGED MEDIUM-SPEED FOUR-STROKE DIESEL ENGINE MODEL VD 48/42 BY SKL. *(Untersuchungen zur Abgastruebung am hochaufgeladenen, mittelschnellaufenden Viertakt-Dieselmotor VD 48/42 des SKL). Text in German. Seewirtschaft, 7(3):157-161, 1975. 10 refs.*

The exhaust gas turbidity in a highly charged medium-speed four-stroke diesel engine model VD 48/42 by SKL, East Germany, is examined. Exhaust gas analyses and high-speed photography show that unburned fuel is primarily responsible for exhaust gas turbidity under partial load conditions. Exhaust gas turbidity can be abated most efficiently by improving the jet atomization (reduction of the orifice diameter and of the blind hole volume), and by advancing the initiation of delivery. These measures reduced exhaust turbidity from about 70% to 5% (0.5 SZ Bosch). The exhaust was smokeless at higher loads. The injection system should be dimensioned for the actual nominal stroke volume instead of being overdimensioned with respect to the flow cross sections.

52081 **APTIC NO. 74863**

Yamaya, Hideo

ORGANIZATION OF THE LOOP ROUTE 7 LIAISON ASSOCIATION OF AIR POLLUTION CONTROL AND MONITORING MOVEMENT OF NITROGEN DIOXIDE. *(Kannana kogai taisaku renraku kai no kessei to nisanka chisso sokutei undo). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo (Japan), p. 290, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975, Paper 142.)*

The automobile-caused air pollution along the Loop Road 7 in Tokyo, one of the areas busiest roads, received public attention as the result of a wind areal measurement for nitrogen dioxide along the road which was carried out with the participation of the inhabitants of 7 Tokyo Wards. The effort by the area s inhabitants to gain public support is described. The air samples were collected by small samplers at 1000 different locations along the road for 3 days during the summer of 1974, and were analyzed for NO2. There were no locations that recorded NO2 levels below the environmental standard. Of the sampling locations, 27.4% had NO2 levels higher than 0.1 ppm with a maximum determined value of 0.43 ppm, which was more than 20 times higher than the NO2 standard. The measurement results were reported in newspapers which gave public support to the inhabitants movement for the improvement of the areal pollution control by the metropolitan government.

52082 **APTIC NO. 74582**

SURVEY ON THE WASTE WATER AND EXHAUST GAS AT THE PRIVATE HIGH SCHOOL. *(Shiritsu koto gakko ni okeru haieki haigasu ni kansuru chosa). Text in Japanese. Shigaku Kyoiku Kenkyusho Kiyo (J. Jap. Private Sch. Educ. Inst.), no. 23:75-78, 1975. 38 refs.*

An investigation of waste gas and waste water at private high schools in the Tokyo area was conducted by distributing questionnaires to 244 such schools. The 122 schools which responded were divided into two groups, and the following results on air pollutants were found: only 1.4% of group I and none of group II state that the carbon monoxide concentrations at school laboratories were fairly high; 65% of group I and 63.4% of group II gave very low sulfur dioxide concentrations; and none of group I but 1.7% of group II claimed high hydrogen sulfide concentrations.

52083 **APTIC NO. 74968**

Mechanical Engineering Lab. (Japan)

EXPERIMENT OF THE EMISSION CHARACTERISTICS OF AUTOMOBILE ENGINES. *(Jidosha enjin haiki tokusei no jikken). Text in Japanese. In: Report of Mechanical Engineering Lab., 33p., June 1975.*

For the purpose of obtaining data for establishing the forecasting method for localized air pollution due to automotive exhaust emission, the emission quantity of carbon monoxide, hydrocarbons, nitric oxide, and nitrogen oxides corresponding to 10 types of driving mode were measured using a chassis dynamometer. A total of 26 vehicles of five types including passenger cars and trucks were used for the measurement at 10 types of driving mode including 10 mode driving, idling, cruising (20, 30, 40, and 50 km/hr) and four ttypes of driving modes of cruising and acceleration or deceleration at peak hour and off peak hour of traffic congestion. A description of measurements method and measurement equipment are given. Data of pollutant concentrations at each driving mode are given with data of fuel consumption and driving distance.

1974

52084 **APTIC NO. 76706**

Brewer, S. T., L. L. Bennett, J. T. Day, W. D. Franklin, M. Mutsakas, and R. G. Ort

COMPARATIVE RISK-COST-BENEFIT STUDY OF ALTERNATIVE SOURCES OF ELECTRICAL ENERGY. APPENDIX A: ENERGY EXPENDITURES ASSOCIATED WITH ELECTRIC POWER PRODUCTION BY NUCLEAR AND FOSSIL FUELED POWER PLANTS. *Atomic Energy Commission, Washington, D. C., Office of Energy Systems Analysis, 58p., Dec. 1974. 22 refs.*

NTIS: WASH 1224-A

An analysis of the energy expended at each step in the fuel cycle for each of several power plant types, per unit of net electrical energy delivered to the average consumer outside the system, is presented. The studies cover the pressurized water reactor, the boiling water reactor, and coal-, oil-, and gas-fired steam plants. Energy consumptions at each step in the fossil and nuclear power plant fuel cycles are estimated, providing overall heat ratings for each complete fuel cycle. Energy requirements for pollution abatement and losses in transmission are also estimated. Wet scrubbing processes require fairly high energy inputs, while dry limestone injection processes require the smallest input of both thermal and electrical energy for stack gas desulfurization at fossil fuel plants. Data are also provided for the energy requirements associated with fuel desulfurization.

52085 **APTIC NO. 74372**

Fukaya, Hideyo and Koji Kato

EVAPORATION OF METALS FROM HEATED PVC. *(Kanetsu ni yoru PVC kara no kinzoku no kisan). Text in Japanese. Enbi to Porima (Polyvinyl Chloride Polym.), 14(8):20-24, Aug. 1974. 7 refs.*

Experiments measuring the evaporation of metal fume from polyvinyl chlorides containing metal stabilizers were conducted. Some 20 different stabilizers were used, including stearic acid lead, stearic acid calcium, stearic acid cadmium, stearic acid zinc, stearic acid magnesium, and dibutyl tin. About 4 g of each were mixed with PVC at 170 C for 5-15 min and rolled into sheets. The sheet was preheated for 5 min at 150-170 C and, after applying 65 kg/sq cm pressure for 2 min, a cold pressure of 100 kg/sq cm was applied for 3 min. This material was heated on a silica carbide tube electric furnace in an alumina boat with a boat cover, and the temperature was applied for 30 min. The metal evaporation was measured by analyzing the residue metal by atomic absorption. The resin decrease with heat showed no difference among different stabilizers; but in all cases the decrease in weight was started by dechlorination at about 220 C, and this continued until 300 C. Subsequently, a weight decrease was reinitiated at 420 C by carbon-bond breakage. The evaporation of tin started at 150 C and was completed at 250 C. Cadmium started to evaporate suddenly at about 400 C and completed its evaporation at 500 C. Zinc began to evaporate slowly at about 200 C. Lead, Mg, and Ca began to evaporate at 450 C, and the Pb evaporation rate increased significantly after 500 C. Measurements of metals in incineration ash, fly ash, cooling jet water, smoke scrubber water, and unused industrial water were made at a couple of incineration plants. The ratio of Cd in fly ash was 4-7 times higher than that in incineration ash. The concentrations of heavy metals such as copper, Pb, Zn, Mn, iron, and mercury were higher in scrubber water than in any other water used in the plant, suggesting high amounts of metal fume in the smoke. Predistillation of refuse at a low temperature before direct incineration is necessary to prevent heavy metal evaporation.

52086 **APTIC NO. 76644**

Gratz, Reinhard

FLUORIDE IN CERAMIC MATERIALS AND FUELS--MATERIAL MEASURES FOR PREVENTION OF FLUORIDE EMISSIONS (FINAL REPORT). *(Fluor in keramischen Materialien und in Brennstoffen. Stoffliche Massnahmen zur Vermeidung von Fluor-Emissionen). (Schluss). Text in German. Ziegelind. (Weisbaden), (5):210-216, 1974.*

Fluoride emissions from the big ceramics industry are described, and prevention methods of fluoride emissions are discussed. After describing the properties of fluoride and its compounds, the effect of fluoride emissions is analyzed. After presenting measurement methods for fluoride emissions, the emissions in the earthenware industry are described. Fluoride appears in ceramics raw materials in various quantities, depending upon the quality of the minerals and the properties of the compounds. The alloys used and the quality of the fuel also significantly influence the fluoride emissions. The type of ovens and chimneys also play an important role, including oven atmosphere, duration of combustion, and combustion temperature. Recommendations are made based on literature and the research results of the Institute for Bricks Research for decrease of fluoride emissions. They concern fuel quantity, oven atmosphere, and chimney gas atmosphere. Some measures are opposed to requirements of optimal combustion. Measurement methods for fluoride emissions are described.

52087 **APTIC NO. 74442**

Honma, Tatsuo and Hiroshi Yamada

BASIC FACTS ABOUT DYE POLLUTION CONTROL. *(Senshoku kogai boshi kiso koza). Text in Japanese. Kako Gijutsu (Pap. Converting), 9(6):12-15, 1974.*

The toxic and malodorous compounds used in the dyeing process are numerous and some examples are given. The inorganic compounds are classified into acids (sulfuric acid mist and hydrochloric acid emission), alkali (ammonia gas emission), salt (nitrite), oxidizing agents (chlorine compounds and organic acids such as peracetic acid), and reducing agents (sulfur compounds such as sodium sulfide, sodium hydrogen sulfite, hydrosulfite and hydrogen sulfide produced by the reaction with acid). The organic compounds are classified into saturated aliphatic hydrocarbons (various petroleum products including petroleum ether, petroleum benzene, mineral spirit, kerosene, spindle oil, and heavy oil), aromatic HCs (C6H6, toluene, xylene and naphtha), aliphatic halogenated HCs, (trichloroethylene, perchloroethylene and perchloroethane), carrier solvents, (chlorobenzenes and chloronaphthalene), dyes, resins used for resin finish (acrylic resins and formalin emitted during resin process), and others (styrene used for styrene graft processing of silk). The toxicity of these and common methods are described.

52088 **APTIC NO. 74427**

Matsuno, Takeo, Tomoo Tashiro, and Shunichi Uchiyama

PROTECTION OF ENVIRONMENTAL POLLUTION BY MERCURY VAPOR: EMISSION RATE OF HG TO AMBIENT AIR. *(Kinzoku suigin no kankyo osen boshi: taiki eno itsusan sokudo). Text in Japanese. Yokohama Kokuritsu Daigaku Kankyo Kagaku Kenkyu Senta Kiyo (Bull. Inst. Environ. Sci. Technol., Yokohama Natl. Univ.), 1(1):82-87, 1974. 21 refs.*

Mercury vapor diffusion from a top box used in sodium chloride electrolysis plants was studied. The top-boxes contain sodium hydroxide solution and metallic mercury, and the boxes are usually open to the ambient air. The solubility of mercury in 0.1 N NaOH solution was determined by flameless atomic absorption spectrometry and was higher for NaOH solutions containing oxygen. An oxygen-containing 0.1 N NaOH solution dissolved 76.8 ppm Hg at 60 C, while the dissolution was 0.24 ppm for NaOH without oxygen. A semi-theoretical formula for evaporization rate of Hg through the top-box was proposed. The escape of mercury from the top-box to the ambient air was calculated at 0.057 mg/sq m/min at 60 C, assuming that no external force was applied to mix the Hg and NaOH solution.

52089 **APTIC NO. 74914**

Nishi, Ryo, Teruo Sawada, and Kyokuyu Danjo

ACCELERATION AND DECELERATION CHARACTERISTICS OF GAS TURBINES AND THE AMOUNT OF DISCHARGED EXHAUSTS. *(Gas turbine no kagensoku tokusei to osenbutsu haishutsu ryo ni tsuite). Text in Japanese. Preprint, Gas Turbine Committee of Japan, Tokyo, p. 131-136, 1974. 5 refs. (Presented at the Gas Turbine Committee of Japan, Periodical Meeting, 2nd, Tokyo, June 1974.)*

A two-axis, open gas-turbine was used for an exhaust emission study. Carbon monoxide, total hydrogen carbons, and nitrogen oxides were continuously measured. In the transition state, the concentration of total pollutants increased only a little compared with that during the stationary state. In the course of acceleration, the NOx concentration showed an overshoot; and, in the course of deceleration, the CO concentration and the total hydrocarbon concentration showed an overshoot. The change in NOx concentration during the transition state corresponded with that of the air-fuel ratio. The CO concentration showed a negligible correlation with other parameters of the turbine because the composition of the hydrocarbons changed with changes in driving conditions of the turbine. The amounts of discharge of nitric oxide was inversely proportional to that of nitrogen dioxide in both the stationary and transition states.

52090 **APTIC NO. 74935**

Nishibayashi, N.

ENVIRONMENTAL TRAFFIC CAPACITY OF A ROAD NETWORK. *(Doromo no kankyo kotsu kyoyoryo ni kansuru ichikosatsu). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, Vol. 4, p. 282-283, 1974. 4 refs. (Presented, at the Japan Society of Civil Engineers, Lecture, Meeting, 29th, Tokyo, Japan, 1974.)*

A method of calculating the traffic capacity of road network is described. Restrictions on environmental traffic capacity for each link (between each road) and the restriction of total mileage which determines the maximum flow were considered. The latter restriction is for the total emission of pollutants. Only traffic volume was considered here. A formula was derived to calculate emission rates.

52091 **APTIC NO. 76675**

Potter, James D., Marlin J. Eller, Susan G. Gordon, Thomas L. Harmon, Gilbert C. Maxey, and James L. Pringle

MATHEMATICAL MODELING OF NOISE AND AIR POLLUTION AT EXPANDING ONTARIO INTERNATIONAL AIRPORT (FINAL TECHNICAL REPORT). *Preprint, Harvey Mudd College, Claremont, Calif., 73p., June-Aug. 1974. 14 refs.*

A computer simulation model for smog production in the region surrounding the Ontario International Airport located in the Ponoma-Walnut Valley which is east of Los Angeles was constructed to predict and compare air pollution levels for 1985 with and without a proposed new runway in operation. The model involved the movement of a sample cell across the valley according to the wind velocity, the appropriate addition of automobile and factory pollutants to that cell, and the progression of a photochemical reaction mechanism within it. A system of 19 nonlinear differential equations obtained from the reaction sequence was approximated with a third order semi-implicit Runga Kutta. The air pollution difference with and without the proposed runway in operation was 0.8% which was considered to be insignificant. Calculated and measured concentrations of ozone and nitrogen oxides are illustrated along with the photochemical reaction mechanism employed. (Author abstract modified)

52092 **APTIC NO. 74630**

Regulski, Wlodzimierz and Antoni Susek

THE METHANE HAZARD DETERMINED BY THE FORECAST METHOD DEVELOPED BY THE BARBARA EXPERIMENTAL MINE BASED ON THE EXAMPLE OF THE MINE. *(Porowanie rzeczywistego zagrozenia metanowego z zagrozeniem okreslonym metoda prognozowania, opracowana przez Kop. Doswiadczalna Barbara na przykladzie Kop. Staszic). Text in Polish. Przeglad Gorn., 30(3):148-151, 1974. 1 ref.*

An attempt at determining the methane hazard in coal mines by means of the forecast method is presented. It considers the real methane content in the stratum worked upon as well as the zone of the degasification of the upper and underlying strata in order to develop forecast possibilities to avoid hazards resulting from methane emanations. The stratum was 2.12 m thick. Two walls were dug and both were aerated by a serial flow of air. The total quantity of the methane was calculated based on emanation from the exploited coal, the wall, the corridors, and the galleries above and under the gallery studied. Detailed equations and calculations are given along with illustrations. The results of the forecast were compared with the real methane emanation. The relative forecast was 9.50 cu m methane/min as compared to a mean real methane emanation of 12.82 cu m methane/min. The forecast did not differ much from the real emanation noted during exploitation of the stratum. Forecasting can be used to determine, once the mean is surpassed, that the hazard is of the third degree. The method takes into consideration the fact that 50% additional emanations might occur. It is essential to consider also the adjoining strata during exploitation, when trying to determine the methane hazard in a coal mine.

52093 **APTIC NO. 76723**

Rybin, Miroslav and Jan Pivonka

FORMATION OF NITROGEN OXIDES IN AN EXPERIMENTAL FUEL RESEARCH INSTITUTE. *(Sledovani tvorby kyslicniku dusiku no experimentalnim praskovem ohnisti UVP). Text in Czech. Ochrana Ovzdusi, 6(4):45-48, April 1974. 6 refs.*

A special experimental furnace designed by the Fuel Research Institute of Bechovice to correspond as much as possible to the powdered coal-fired furnaces used in most electrical power plants, was used to investigate the formation of nitrogen oxides during combustion of powdered lignite. Nitrogen oxide was determined colorimetrically. The presence of sulfur dioxide did not affect the detection of nitrogen oxides. Nitric oxide was not detected by a photometric method because of its fast oxidation to nitrogen dioxide. The nitrogen oxide contents depended directly on the amount of excess combustion air. There was also some indication that elevated temperatures increased the formation of nitrogen oxides.

52094 **APTIC NO. 76727**

Sawa, N., S. Hori, and U. Iijima

THE EFFECTS OF WET METHANOL ON WASTE GAS IN THE DIESEL ENGINE. *(Diizeru kikan no haiki no oyobosu gansui metanoru no eikyo). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 345-350, 1974. 2 refs. (Presented at the Japan Society of Mechanical Engineers Yamanashi Lecture Meeting, Yamanashi, Japan, Nov. 16, 1974.)*

The effects of anhydrous and wet methanol injection from a suction tube, the recycling of waste gas, the preheating of a mixture of air and methanol gas, and the addition of hydrogen peroxide to engines were studied. Cylinder combustion pressures were recorded and the combustion conditions and noise of the methanol engine were discussed. The effect of wet methanol fuel, the preheating of suction tubes and simultaneous addition of methanol, the effect of adding methanol, waste gas recycling and the effect of adding hydrogen peroxide were presented. The nitrogen oxide and diesel smoke concentrations decreased as the amount of wet methanol increased. Waste gas recycling decreased the NOx concentration but increased the diesel smoke concentration. The addition of hydrogen peroxide decreased both the NOx and diesel smoke concentrations.

52095 **APTIC NO. 76686**

Swiatosz, Edmund, Walter S. Chambers, and Paul D. Grimmer

FEASIBILITY DEMONSTRATION OF A NON-POLLUTANT SYNTHETIC FIRE FIGHTING TRAINER (FINAL REPORT). *Naval Training Equipment Center, Orlando, Fla., Physical Sciences Lab., Task 1734, Rept. IH-241, 52p., Dec. 1974. 11 refs.*

A logic controlled array of gas burners responding to hose water application was investigated as a non-polluting alternative to fire fighting training facilities that use diesel oil. Propane was used as the fuel for the burners. Carbon monoxide generation was particularly sensitive to the air-fuel ratio and stack and bottom draft openings, provided that the dominating effect of heat transfer cooling of the flames was minimized. The CO readings during open air tests varied from about 0.0005% at high air-fuel ratios to about 0.01% at lower air-fuel ratios. Hydrocarbon levels during open air tests were around 0.1%, and nitrogen oxide levels under the same conditions were approximately 2.5 ppm. An air-fuel ratio of between 4.0 and 12.0 resulted in nontoxic and realistic flames.

52096 **APTIC NO. 76721**

Toman, Pavel

INTRODUCTION OF SMOKELESS LUBRICANTS TO PRODUCTION OF PRESSURE DIE CASTINGS. *(Zavadeni bezdymych mazadel pri vyrobe tlakove litych odlitku). Text in Czech. Slevarenstvi, 22(6):222-224, June 1974. 1 ref.*

Smokeless lubricants were tested at an aluminum die-casting plant for use in the pressure die-casting process. The objective was to find a lubricant that produced less air pollution than that produced by mineral oils. The general selection criteria were: good separability of castings from die at 300 C, the tendency of the material to accumulate at the die surface, evaporation of the liquid and its odor, suitability to automatic application, and economic considerations. The following water-soluble lubricants manufactured by Acheson Colloiden N. V. of Holland were selected: DAG S 5090 for use in small and medium machines, DAG S 1163A for automatic lubrication of large-casting Wotan machines, DAG 5087 for automatic lubrication of pressure pistons in Wotan 2000-2800 machines, and DAG S 5099 for use as a separating agent to prevent aluminum from sticking to the surface of the die.

52097 **APTIC NO. 74824**

Watanabe, Yoshihiro

ON THE ENVIRONMENT OF AUTO GARAGES AND PARKING LOTS IN BUILDINGS. *(Jidosha seibi kojo oyobi biru chusa jo no kankyu ni tsuite). Text in Japanese. Preprint, Japan Industrial Safety Assoc., Tokyo, p. 186-188, 1974. (Presented at the Nationwide Industrial Safety and Hygienic Conference, General Meeting, Tokyo, Japan, Nov. 6-8, 1974.)*

Survey results of pollution levels in indoor parking lots, merchandise unloading areas of department stores, and auto garages are given with descriptions of facilities (floor plan, ventilation system, and ventilation capacity). In the indoor parking lot, the carbon monoxide concentrations measured were over-all average 33 ppm, maximum value 245 ppm, and minimum value 3 ppm. In the case of an unloading area without a special ventilation system, the concentrations were 0.8-1.0 mg/cu m for particulate matter, and 5-40 ppm for CO (0-5 ppm in the absence of vehicles). In nine auto garages investigated, one had a ceiling fan and the others were without special ventilation systems. The particulate concentration was 0.2-1.2 mg/cu m. The CO concentrations were 30-120 ppm in the vicinity of idling autos, 1000-1500 ppm at the rear of idling autos, and 5-10 ppm when the auto engines were turned off. The nitrogen oxides detected sporadically were at the level of 0.3-0.5 ppm. The average lead concentration measured was 0.035 mg/cu m.

52098 **APTIC NO. 74474**

Kanagawa Prefectural Government

STATUS OF SOURCES OF AIR POLLUTION. *(Taiki osen no hasseigen no jokyo). Text in Japanese. In: Environmental White Paper in 1974, p. 138-145, Dec. 1974.*

Data on stationary and mobile sources of air polltion in Kanagawa Prefecture were compiled. The number of facilities with emission sources such as boilers, metal furnaces or incinerators which emit sulfur oxides, nitrogen oxides, suspended particulates, and toxic substances were compiled by by the type of emission source in 37 municipalities. The total number of facilities was 8652 as of Dec. 1973, which comprised increase of 572 over that counted the previous year. The number of facilities with emission sources of particulate matters registered in compliance with the air pollution control law was 532 as of Dec. 1973 (6.4 % increase over the previous year). The number of such facilities in 24 municipalities was compiled by the type of pollutant source. The vapor control regulation was applied to storage tanks of crude oil, kerosene, naphtha, jet fuel and organic solvent. The number of storage tanks as of March 1974 was 189 in Yokohama and 122 in Kawasaki. A mobile pollution sources, including the number of motor vehicles registered in the last 5 yer were compiled by vehicle type; there was a 1.66-fold increase over the last 5 yr. The traffic volumes on major highways during the period of 1965 to 1971 were also compiled.

52099 **APTIC NO. 74804**

Osaka Prefectural Government (Japan)

PRESENT SITUATION OF ENVIRONMENT POLLUTION. NO. I. AIR POLLUTION. *(Kogai no genkyo. Dai I sho. Taiki osen). Text in Japanese. In: Environmental White Paper in 1974, p. 103-113, Oct. 1974.*

The air pollution data of Osaka prefecture for several years up to 1973 are compiled and analyzed. The topography and meteorological conditions (pressure pattern, wind direction, wind velocity, insolation, temperature, humidity, and precipitation) are given. Data on the amount of fuel consumption and sulfur dioxide emission quantity are compiled and analyzed with data collected since 1968. Data on the increase in traffic volume and quantity of gasoline sales are analyzed in relation to the pollution due to automotive exhaust gas. Measurement methods for sulfur dioxide, suspended particulates, settling particulates, carbon monoxide, nitrogen oxides, oxidant, and hydrocarbons are described, and data on each pollutant are given in tabular form, diagrams, and concentration distribution maps. Data on photochemical smog and the number of forecast and warnings issue are compiled.

52100 **APTIC NO. 76653**

Aircraft Nuisance Prevention Assoc. (Japan)

ACTUAL INVESTIGATION REPORTS ON THE AIR POLLUTION AROUND FUKUOKA AIRPORT. *(Fukuoka kuko shuhen ni okeru taiki osen jittai chosa hokokusho). Text in Japanese. 80p., Nov. 1974.*

An air pollution survey was conducted at Fukuoka airport during the period of July 26-29, 1974. Data of carbon monoxide and hydrocarbon concentrations measured at 10 measuring points and nitrogen oxides, formaldehydes, and suspended particulate concentrations measured at three measuring points are compiled. The average concentrations were 0.7 ppm for CO, 2.01 ppm for HC, 0.014 ppm for NOx, 0.010 ppm for HCHO and 200 micrograms/cu m (24-hour value) for suspended particulates. The description of measurement method, map of measuring points, and photographs of 10 measuring points are also given. As references, the environmental standard for sulfur dioxide, nitrogen dioxide, and oxidant, background for the determination of standards, and environmental effects of these pollutants are also included.

52101 **APTIC NO. 76666**

Atomic Energy Commission, Office of Energy Systems Analysis

COMPARATIVE RISK-COST-BENEFIT STUDY OF ALTERNATIVE SOURCES OF ELECTRICAL ENERGY. A COMPILATION OF NORMALIZED COST AND IMPACT DATA FOR CURRENT TYPES OF POWER PLANTS AND THEIR SUPPORTING FUEL CYCLES. *247p., Dec. 1974. 274 refs.*

NTIS: WASH-1224

A compilation of normalized cost and impact data for current alternate sources of electrical energy and their supporting fuel cycles is presented as part of a comparative risk-cost-benefit study. Alternate fuel cycles considered include: coal, residual fuel, and natural gas fuel cycles; nuclear fuel cycles; and hydroelectric power. Representative costs and impacts of alternate systems are assembled and normalized to 6.57 billion kilowatt-hr, the annual energy produced by one 1000-megawatt unit operating at 75% capacity. Impacts and costs are related to occupational and public health, property and material damage, environmental burdens, and abatement procedures.

52102 **APTIC NO. 76669**

California Air Resources Board, Sacramento, Evaluation and Planning Div.

EMISSIONS FORECASTING METHODOLOGY (STAFF REPORT). *Dept. of Housing and Urban Development Grant CPA-CA-09-39-1032, 91p., July 1974. 27 refs.*

NTIS: PB 238259

An emissions forecasting methodology for California is described. Techniques and specific emission factors for 1975, 1985, and 1995 are given for both mobile and stationary (industrial and non-industrial) sources. Motor vehicle emissions are based on the constant volume sampling CVS-2 test cycle and a data base specific for California. Current and developing approaches as well as driving cycles used to quantify motor vehicle emissions are discussed; speed adjustment factors are also considered. Stationary sources are divided into power plants and other stationary sources. Power plant emissions are based on projections of electrical energy generation, and other stationary source emissions are based on normalized projections of total earnings by source category. The base year for the stationary source emissions is 1972. Emission factors are projected for nitrogen oxides, sulfur dioxide, carbon monoxide, particulates, reactive gases, and total organic gases.

52103 **APTIC NO. 76670**

Stichting CONCAWE, The Hague (Netherlands), Ad Hoc Group on Aromatic Contents of Gasolines

EFFECT OF GASOLINE AROMATICS CONTENT ON POLYNUCLEAR AROMATIC EXHAUST EMISSIONS. *Rept. 6/74, 64p., Sept. 1974. 38 refs.*

The effect of increased gasoline aromatic content on polynuclear aromatic emissions was investigated. Measurements of PNA exhaust emissions were made at five laboratories using the same fuels and a total of 15 European cars with varying degrees of emission control. An increase in the gasoline aromatic content of from 34-44% which is larger than that anticipated as necessary due to European lead legislation, resulted in an exhaust PAN increase of only 9% on the average. There were large differences in PNA emissions between the cars tested, and those cars designed for control of hydrocarbon emissions gave the lowest PNA values. Thus, increases in fuel aromatics content are not likely to result in large PNA exhaust increases. Also vehicles are only a minor contributor of PNA emissions in Europe. (Author summary modified)

52104 **APTIC NO. 76695**

Hittman Associates, Inc., Columbia, Md.

A STUDY OF INDUSTRY RESPONSE TO POLICY MEASURES DESIGNED TO IMPROVE AUTOMOBILE FUEL ECONOMY (FINAL REPORT). *Council on Environmental Quality, Dept. of the Interior, Dept. of Transportation, and the Environmental Protection Agency, Contract EQ4AC006, Rept. HIT-571, 177p., Feb. 1974. 141 refs.*

NTIS: PB 234625

A study of the response of the automobile industry to policy measures designed to improve automobile fuel economy is presented. The study consists of two tasks: the first describes near term technical alternatives available to automobile manufacturers for increasing fuel economy, and the second task predicts the composite nature of each class of passenger automobile that would be produced under a variety of tax and regulatory schemes. Automobile modifications are examined for six vehicle classes: subcompact, compact, loaded compact, intermediate, standard, and luxury. Probable modifications to 1974 automobiles which can be implemented in model years 1975 through 1985 include: lean burn engines, electronic fuel injection, stratified charge engines, and displacement reduction. Diesel and rotary engines are also given consideration. The effects of emission controls on fuel economy are incorporated in the data for all classes for the years 1975 and 1976, and a tabular summary of such controls is provided.

1973

52105 **APTIC NO. 74620**

Campos Venuti, Gloria, Gianfranco Donelli, Luciano Maiani, Francesco Pocchiari, Ugo Sellerio, and Eugenio Tabet

HEALTH PROBLEMS IN POWER PLANT SITE SELECTION. *(Riflessi sanatari dell insedimento delle centrali termoelecttriche). Text in Italian. Ann. Ist. Super. Sanita (Rome), vol. 9:79-101, 1973. 21 refs.*

The biological and physical problems connected with air pollution generated by power plants are discussed along with some safety rules adopted to control air pollution. In 1970, the consumption of electric power in Italy was 116,000,000,000 kW-hr (1975 kW-hr pro capita). Pollution from power plants resulted from both normal operation and from work accidents. Sulfur dioxide, carbon monoxide, nitrogen dioxide, and dust accounted for the greatest amounts of the pollution. The antipollution laws in Italy differentiate between real damage limits and nuisance levels for toxic emissions. These laws also call for the installation of a pollution monitoring system at all industrial complexes to establish an air pollution surveillance network in industrial areas. The network is under the jurisdiction of the Ministry of Health. A method of assessing acceptable health risk levels when industrialization of an area is planned is proposed. This method is based on socio-economic and ecological factors for the region, climatic and topographical considerations, and the type of power plant to be built.

52106 **APTIC NO. 76699**

Gallopoulos, N. E., J. C. Summers, and R. L. Klimisch

EFFECTS OF ENGINE OIL COMPOSITION ON THE ACTIVITY OF EXHAUST EMISSIONS OXIDATION CATALYSTS. *Society of Automotive Engineers, New York, 36p., 1973. 9 refs. (Presented at the Society of Automotive Engineers, National Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973.)*

The effect of engine oil composition on the activity of oxidation catalysts for exhaust emission control of hydrocarbons and carbon monoxide was investigated. Platinum, palladium, and copper- chromium oxidation catalysts were exposed to exhaust gases during a steady-state engine-dynamometer test in which the amount of oil consumed per unit volume of catalyst was high. Conventional SE oil caused a somewhat greater loss of catalyst activity than ashless and phosphorus-free oil when unleaded gasoline (0.004 g/gal Pb) was used. A test run with low-lead gasoline (0.5 g/gal Pb) and clean oil caused much greater catalyst activity deterioration. Engine oil effects on catalyst durability appear to be only of secondary practical importance, and conventional SE engine oils are expected to be acceptable for cars equipped with catalytic converters. (Author abstract modified)

52107 **APTIC NO. 74645**

Nakai, T.

INVESTIGATION RESULTS ON THE CONTAMINATION RATE CLASSIFIED BY POLLUTION SOURCES REGARDING NITROGEN OXIDES. *(Chisso sankabutsu hasseigen betsu osen kiyoritsu chose kekka). Text in Japanese. Kankyo Hakai (Environmental Destr.), 4(12):65-66, 1973.*

Sources of nitrogen oxide pollution in Japan are reviewed. The total NOx emission emission in Tokyo in 1972 was an estimated 96,364 tons; 31% was caused by stationary sources, and 69% was caused by mobile sources (38.9% by passenger cars, 29.2% by freight cars, and 0.9% by airplanes). The total NOx emission in Kawasaki in 1972 was 49,720 tons, with 81% being caused by stationary sources and 19% by automobiles. The total NOx emission of Tokyo, Saitama, Chiba, and Kanagawa Prefectures in 1970 was 443,800 tons. Mobile sources contributed more NOx than stationary sources in Tokyo, while the reverse situation was true for other prefectures.

52108 **APTIC NO. 76704**

O Sullivan, John B., William A. Summerson, and John A. Russell

EMISSION CHARACTERISTICS OF SMALL INDUSTRIAL ENGINES. *Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1973. 6 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730857.)*

Emissions data obtained for a variety of small industrial engines (gasoline, diesel, gas turbine, and rotary) used primarily for Army field power generation are presented. The effect of fuel composition on exhaust emissions is also investigated. Emissions from gasoline engines used in generator set applications are generally much higher than those observed in other applications since they are operated on the rich side to enable rapid response to load transients. Diesel engines are lower in carbon monoxide and hydrocarbons and higher in nitrogen oxides than gasoline engines; gas turbines are intermediate. Emission variability from engine to engine appears to mask out any major trends with engine size, and this variability as well as variance in test replication also masks out any changes that might be observed as a result of fuel additives. (Author abstract modified)

1968

52109 **APTIC NO. 76712**

Burnay, G. and A. Jacquemin

THERMIC OUTPUT OF THE BOILER-BURNER UNIT. *(Le rendement thermique de l ensemble chaudiere-bruleur). Text in French. In: Report on the Cedicol Study-Day, p. 3-15, 22-32, Oct. 29, 1968.*

The efficiency of a boiler burner unit in central heating boilers burning liquid fuels is discussed in light of the difficulties posed by the harmonious coupling of the unit and testing techniques. The various factors to be considered when preparing the thermic balance sheet for a fitted generator are analyzed. The main parameters influencing the output of the unit under normal working conditions are examined. Boilers in Belgium have been subjected to the NBN 234 standard test for the last 20 yr. The test presented applies to all types of boilers, including the fitting up of the burning chamber. Emissions through the chimney depend upon the volume and the temperature of the fumes released by combustion. According to standards, the carbon monoxide content generated by the incomplete burning of the gasses should not exceed 0.1% for liquid fuels. The Bacharach smoke test indicates the fumes content in incompletely burnt solids. The Belgian standards limit the Bacharach index to 3. Boilers functioning at 35% of their capacity suffer 3.5 to 5% losses. They are residential boilers, functioning at 45 to 50 C, and using from 30,000 to 100,000 kcal/hr. The sounding rods should be properly disposed to eliminate dead zones. Refractory materials favor longevity of flame and protect the most exposed surfaces. The main difficulties encountered in controlling the burner are discussed. According to Tipler, a study of the aerodynamics of combustion systems should take precedence over investigations of the process of atomization. External flue gas recirculation has a beneficial effect on carbon formation. The design of the structure and the choice of materials have an important effect on noise emission. Similar analyses of the acoustic properties of the boilers and flue systems are necessary.

CONTROL METHODS

1975

52110 **APTIC NO. 74391**

Akazuka, S., M. Kawahara, and Y. Shimizu

FABRICATION OF THE HYDRODESULFURIZATION REACTOR USING HEAVY SECTION PLATES. *(Gokuatsu kohan o shiyo shita chokusetsu datsuryu riakuta no seisaku). Text in Japanese. Hitachi Hyoron, 57(3):223-228, March 1975. 6 refs.*

A large scale hydrodesulfurization reactor designed to withstand severe reaction conditions was built for the first time using heavy metal section plates and employing electroslag welding technique. The design specifications of the reactor and material specifications are given. The actual method of determining heavy section plate material specifications in regard to the chemical composition (impurity content), mechanical properties (tensile strength at room temperature and elevated temperature and impact strength) and heat treatment conditions are described with measurement data. The fabrication process of the reactor body ring by hot bending using bending roller or press and that of the hemispherical head by hot press and electroslag welding process are described with data from testing mechanical properties of the welded parts by electroslag welding and submerged arc welding and chemical analysis results of welded layers. Photographs showing the fabrication process and finished reactor are also included.

52111 **APTIC NO. 74878**

Amano, Masuo, Sadao Kajiya, Masahiko Nakata, Nobuyuki Kobayashi, and Osamu Nomura

REDUCTION OF DISCHARGE GAS EMISSION IN THE COURSE OF WARMING UP OF ENGINES. I. *(Engine danki katei no haiki emission teigen. I). Text in Japanese. Preprint. Japan Society of Automotive Engineers, Tokyo, p. 47-56, 1975. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

A system for reducing automobile exhaust emissions during warm-up is described. The use of an auxiliary acceleration pump which supplies fuel corresponding to the change in the manifold vacuum brings about satisfactory operation even when the choke mechanism is omitted. In the course of deceleration before the engine warms up, the liquid fuel in the intake manifold rapidly evaporates because of the high vacuum, resulting in the condensation of the mixed gas. This causes an increase in the emission of carbon monoxide and hydrocarbons. A supply of air to the inhaling system during deceleration reduces the emission of CO and HC.

52112 **APTIC NO. 74913**

Ando, Toru, Koji Omori, Jinshi Okada, and Ikuo Sakane

EXPERIMENTAL STUDIES ON THE CLARIFICATION OF DISCHARGED GASES AND BLACK SMOKE BY WATER INJECTION IN DIESEL ENGINES. I. PRECOMBUSTION TYPE WITH LOW LOAD. *(Diesel kikan no mizufunsha ni yoru haiki kokuen to haiki gas no joka ni kansuru jikkenteki kenkyu. I. Yonenshoshitsushiki, teifuka no baai). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 1-4, 1975. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

Studies were made with a water-injected diesel engine equipped with a precombustion chamber. The compression ratio, cylinder diameter, and standard injection pressure were 1.90, 98 mm, and 120 kg/sq cm. The injection of water was made by dropping water at the center of the air inlet pipe, injecting steam just before the air inlet manifold, or spraying water from a nozzle. The average diameter of the water particles was 68-75 micron. The last method was more effective than the first one. Almost the same effect was obtained within the addition of 1/3 that of the first method. Best reduction in nitrogen oxide concentration was achieved when the water/fuel ratio was 0.3-0.4. Smoke exhaust was the least when the water/fuel ratio was 0.1. The fuel consumption was best when the ratio was 0.1-0.2. Advanced injection of fuel deteriorated the NOx and the smoke levels, but it improved the fuel consumption. If decreases in NOx and smoke are desired, it is better to delay the injection of fuel and to supply water spray (water/fuel ratio of 0.1). The water spray method is the most practical of the three.

52113 **APTIC NO. 76705**

Barber, J. C., B. P. Dana, and D. R. Waggoner

REUSE OF WASTES IN THE PRODUCTION OF GRANULAR FERTILIZERS. *Preprint, Tennessee Valley Authority, Muscle Shoals, Ala., 34p., 1975. 12 refs. (Presented at the Complete Watereuse: Water s Interface with Energy, Air, and Solids, National Conference, 2nd, Chicago, Ill., May 4-8, 1975.)*

Pilot studies of granular fertilizer processes developed by the Tennessee Valley Authority as part of a program for reusing water wastes are reported. The following granulation processes are described: pan granulation for the production of ammonium nitrate, ammonium nitrate sulfate, and ammonium phosphate nitrate; drum granulation for the production of nitric phosphate by the mixed acid process; and pug mill granulation for the production of ammonium polyphosphate fertilizers. Firm, closely sized granules result in minimum emissions of particulates in the production processes and minimum emissions of fugitive dust when the fertilizer is being loaded or handled. Clay conditioners for granular fertilizers cause some environmental problems. For example, effluents from scrubbers installed to abate dust pollution from conditioner operations are not amenable to reuse. Granular urea ammonium phosphate and ammonium polyphosphate produced in the TVA facility do not require the addition of conditioner to prevent caking, although a small amount of clay conditioner is put on granular urea. Formaldehyde may be added to urea solution prior to granulation to prevent caking. (Author conclusions modified)

52114 **APTIC NO. 76713**

Blokker, P. C.

SURVEY ON NITROGEN OXIDE EMISSIONS FROM STATIONARY SOURCES AND TECHNIQUES FOR REDUCING THESE EMISSIONS. *Stichting CONCAWE, The Hague (Netherlands), Rept. 4/75, 66p., March 1975. 40 refs.*

The generation of nitrogen oxide emissions from stationary sources is discussed along with techniques for reducing such emissions. The predominant cause of thermal NOx formation is the maximum temperature reached in the primary combustion zone and the residence time at that temperature. Nitrogen dioxide formation is caused by the oxidation of nitric oxide at relatively low temperatures and is usually between 5 and 10% of the NOx emitted. Techniques for reducing NOx emissions from boilers include: load reduction, low excess air firing, staged or secondary combustion, flue gas recirculation, lower air preheat temperature, water injection, and design modifications. The emissions from refinery process heaters and stationary engines (piston and gas turbine) are also discussed. The NOx levels from gas turbines are relatively low, but the actual quantity of NOx emitted from a large stationary gas turbine is comparable to that of a typical fossil fuel fired boiler installation. Little is known about the applicability of techniques to control NOx emissions from gas turbines. Piston engines generate high levels of NOx, and the use of a precombustion chamber appears to decrease the amounts generated.

52115 **APTIC NO. 74764**

Doering, H., H. Sommers, and R. Rammler

GASEOUS AND LIQUID FUELS FROM COAL; PRODUCTION OF GAS, TAR AND OIL BY DEVOLATILIZATION OF COAL FOR POWER PLANTS (LURGI-RUHRGAS- PROCESS). *(Gasfoermige und fluessige Brennstoffe aus Kohle; Gas-Teer-und Oelgewinnunng durch Vorentgasung von Kraftwerkskohle - Lurgi-Ruhrgas-Verfahren). Text in German. Erdoel Kohle-Erdgas-Petrochem., 28(5):225-232, 1975. 26 refs.*

The process developed by Lurgi and Ruhrgas in the fifties for the conversion of coal into high-grade gaseous and liquid fuels is described. In this process, gas, tar, and oil are produced by devolitization of coal for power plants using recycled heat carriers without any addition of oxygen or steam. In the high temperature operation, gas is the main products, whereas oil and tar are the major products of the low temperature process. The efficiency is the same in both cases.

52116 **APTIC NO. 74765**

Duemmler, Friedrich

PRESENT TRENDS OF DEVELOPMENT CONCERNING REDUCTION OF WASTE AIR PROBLEMS IN NITRIC ACID AND FERTILIZER PRODUCTION PLANTS. *(Gegenwaertige Entwicklungstendenzen zur Verringerung der Abluftprobleme bei Salpetersaeure- und Vollduengererzeugungs- Anlagen). Text in German. Staub, Reinhaltung Luft, 35(4):124-127, April 1975.*

The purification processes presently used (e.g., alkaline scrubbing, molecular sieves catalytic afterburning, and absorption) were investigated, and it was demonstrated that a further development of absorption technology resulted in the same low emission values as these obtained from other well-known purification processes. One of the advantages, however, was the elimination of unwanted by-products. The alkaline scrubbing process has the disadvantage of being costly and of converting the air pollution problem into a water pollution problem. Dumping or purification of the by-products of this process in a conventional sewage purification plant is not feasible. Application of the molecular sieve requires sophisticated equipment for the adsorption and regeneration stages, and the cyclic switching between the two phases. Nitric oxide and nitrogen dioxide waste gases issuing from complex fertilizer plants are subject to the same conditions as waste gases from nitric acid plants and cannot be eliminated by means of washing units.

52117 **APTIC NO. 74631**

Esche, Michael, Friedrich Hofmann, and Willy Meyer

FIRST OPERATING EXPERIENCES WITH A FLUE GAS DESULFURIZATION PLANT USING THE HOELTER METHOD. *(Erste Betriebserfahrungen mit einer Rauchgasentschwefelungsanlage nach dem Hoelter- Verfahren). Text in German. Staub, Reinhaltung Luft, 35(6):237-239, 1975.*

The Hoelter process proved its usefulness for coal-fired power plants in a 125,000 cu m/hr (about 40 MW) (normal conditions) prototype plant for stack gas cleaning in Germany by more than 2500 hr of operation. There is no scaling and plugging, due to the use of alkaline scrubbing slurry with added chlorine ions. The method removes more than 95% of the sulfur, with low energy consumption. The capacity ranges from 40 to 100%.

52118 **APTIC NO. 74409**

Fritzsche, P.

OPERATING EXPERIENCES WITH COMBINED WET/DRY COOLING TOWERS *(Betriebserfahrungen mit kombinierten Nass-/Trockenkuehltuermen). Text in German. VGB Kraftwerkstechnik, 55(4):225-229, April 1975.*

Wet/dry cooling towers pose no constructional problems and operate reliably. They have been mainly developed to reduce the steam emissions of wet cooling towers. The cooling elements of the dry section are arranged above the wet cooling section. Together they form a unit to which a ventilator is attached. Through the heat exchanger of the dry cooler and through the sprinkling section of the wet cooler, parallel air flows develop which mix in an installation-free section of the cooling tower underneath the ventilator. The mixing of the dry and the wet air flows results in a waste air flow whose temperature and moisture content is lower than in wet cooling towers. The visibility of the steam plume during the cold season is greatly reduced. Various comparative illustrations of both wet cooling towers and wet/dry cooling towers are used to document this.

52119 **APTIC NO. 74775**

Fujimura, K., S. Sugino, S. Nakajima, and K. Katagiri

A NEW GAS-LIQUID CONTACTING (WET DUST COLLECTING) EQUIPMENT OF A GAS DISPERSION TYPE. *(Gas bunsan gata no atarashii kieki seshoku (Shishiki shujin) sochi ni tsuite). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(4):254-261, April 1975.*

The development process of a new gas dispersion type dust collector (Commercial name: UBE-DUC) andd its principle of operation are described. Spontaneous air flow occurs from the inside of the drum to the outer water when the drum with nozzles on the side wall rotates in the water. This spontaneous air flow produces small bubbles homogeneously from the top of the nozzles. This mechanism was utilized for a UBE-DUC gas dispersion type dust collector. From 99.3 to 99.9% dust collection efficiency was reported in cases of different dusts. Some different designs of nozzle shape were considered. The best data showed less than 0.04 g/cu m dust concentration at the outlet.

52120 **APTIC NO. 74807**

Fujiwara, Shigeru

A VARIABLE VENTURI TYPE CARBURETOR. *(Kahen benchuri gata kikaki). Text in Japanese. (Hitachi, Ltd. (Japan)) Japan. Pat. Sho 50-12053. 2p., May 8, 1975. 4 refs. (Appl. March 8, 1971, 1 claim).*

A variable venturi type carburetor with slow fuel supply system is described. The slow fuel injection port is located downstream of the throttle valve at the valve opening for idling and upstream of the throttle valve at the valve opening position further than that of idling so that the mixture ratio can be varied efficiently with vehicle speed for thee purpose of emission control. At low speeds, the fuel is supplied primarily through the slow fuel pipe and slow fuel injection port actuated by the increase in negative pressure and at high speed or high output the fuel is supplied through a nozzle controlled by a float needle valve. By this mechanism, the flow characteristics of the fuel are varied to provide the desired mixture ratio corresponding to the vehicle speed.

52121 **APTIC NO. 74981**

Furukawa, M.

ODOR CONTROL OF THE KRAFT PULP MILL. *(Kraft pulp kojo no shuki taisaku ni tsuite). Text in Japanese. Kamipa Gikyoshi (J. Japan. Tech. Assoc. Pulp Paper Ind.), 29(8):417-425, Aug. 1975. 15 refs.*

Waste gas from a batch-type wooden kettle was led to a blow tank from which it was introduced to a heat exchanger through a jet condenser. The cooled gas was passed through an aftercondenser to a gas holding tank. The gas in the holding tank was released at 3-5 cu m/min by using a blower, and after passing through a series of safety devices including a water-seal, and anti-explosion stack, and a flame arrestor, it was burned at 1300 C in a gypsum- recovering kiln. The primary air to the kiln was supplied at 50 cu m/min or more than 10 times that of the waste gas. The hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide concentrations were reduced from trace, 250-2590 ppm, 216-1730 ppm, and trace-108 ppm, respectively, at the exit of the gas-holding tank to non-detectable levels at the exit of the kiln.

52122 **APTIC NO. 74481**

Gramatke, J. and G. Reichert

EXPERIENCES WITH HARD COAL FIRING IN THE POWER PLANT SCHOLVEN. *(Erfahrungen mit den Steinkohlenfeuerungen im Kraftwerk Scholven). Text in German. VGB Kraftwerkstechnik, 55(5):277-286, May 1975. 4 refs.*

Fly ash collection problems with four hard coal fired units at the power plant Scholven (capacity of 370 MW each) are discussed. The combustible components amounted to less than 3% and bitumen numbers ranged between 25 and 30 units. Electrostatic precipitators did not suffice to meet the required dust reductions. The collection areas of two units were enlarged by 60% so that a travelling speed of 5 cm/sec was attained. With the two other units enlargement was not feasible, and additional precipitators were connected in parallel. With these measures, the dust concentration of the gas was reduced to 80 to 120 mg/cu m, depending on the type of coal used as fuel. Operating problems, combustion chamber considerations, coal pulverization, and ash utilization are also discussed in detail.

52123 **APTIC NO. 74370**

Hamai, Senzo

CONSIDERATION OF ENERGY PROBLEM FROM ENVIRONMENTAL SYSTEM ENGINEERING. *(Environmental systems engineering no ikkan to shite enerugi mondai o kangaeru). Text in Japanese. Gijutsu Pen (Gijutsu Pen), 23(230):2-4, Jan. 1975.*

Automobile emission standards for 1976 are discussed in terms of their possible revision due to technological difficulties experienced by the automobile industry. The use of hydrogen gas fuel as an alternative pollution control approach is very expensive, and no research into the low cost production of such fuel is being performed by government or industry. Hydrogen gas fuel may take the place of electrical energy in the early 21st century. The technological development of low cost hydrogen gas is recommended as opposed to easing the 1976 auto emission standards.

52124 **APTIC NO. 74972**

Hase, Masaru, Shinya Ishihara, Mikio Maki, and Kiyohiko Mizuno

EMISSION GAS PURIFYING DEVICE FOR VEHICLES. *(Sharyo yo haikigasu jyoka sochi). Text in Japanese. (Nippon Denso Co., Ltd. (Japan)) Japan. Pat. Sho 50-12540. 5p., May 13, 1975. (Appl. July 31, 1972, 1 claim).*

At the deceleration, the butterfly valve of the carburetor is closed completely, which caused the increase in residual gas and incomplete combustion, resulting in the increased emission of hydrocarbons and carbon monoxide. The throttle positioner of the carburetor was modified for the purpose or reducing emission of toxic substances by opening the butterfly valve for a given period of time during the deceleration supplying a suitable amount of air to prevent misfire. The device consists of a lever connected to the butterfly valve, a dashpot with main shaft and side shaft actuated with time delay at deceleration from certain vehicle speed, and a positioner which is actuated by the diaphgram corresponding to the actuation of the dashpot, opening the butterfly valve slightly for a given period of time. In the above mentioned device, a labyrinth groove or spiral groove for the main shaft is provided, which enables the movement of the main shaft with time delay when the lever constraint is released.

52125 **APTIC NO. 74544**

Hayashi, K.

TREATMENT OF APPARATUS FOR COLLECTED DUST. *(Shujin dasuto shori sochi). Text in Japanese. (Tokiwa Electric Co. Ltd., Kamuhara City (Japan)) Japan. Pat. Sho 50-6672. 4p., March 17, 1975. (Appl. June 30, 1971, 1 claim).*

A method of continuous removal of collected dust from a dust collector equipped with filter bags is described. A dust containing gas enters the dust-collecting apparatus where the dust is removed by filter bags. The filtered dust is precipitated at the bottom of the apparatus and is then transferred to a dust-removing section by a rotating screw. In the dust-removing section is a piston which pushes the transferred dusts to the bottom. Through the continuous operation of the rotating screw, continuous removal of collected dust can be achieved.

52126 **APTIC NO. 74641**

Higashibata, Heiichiro

TREND OF NOX CONTROL BY FLUE GAS DENITRIFICATION TECHNIQUE. *(Haien datsu sho ni yoru NOx taisaku no doko). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(2):20-24, Feb. 1975.*

Flue gas denitrification techniques currently being studied in Japan are described. Catalytic reduction systems for nitrogen oxides at 250-400 C using base metals were developed by various industries. At the Hitachi Ship Building Co., tests were conducted for the selective reduction of flue gases from a 10,000 N cu m/hr boiler and a 5000 N cu m/hr sintering furnace while at Sumitomo Chemical Co., a 200,000 N cu m/hr methanol heating furnace was in operation using the reduction method. At the Sumitomo Heavy Industries Co., catalysts with activated carbon as base were used for selective reduction and sulfur oxides were recovered simultaneously as ammonium sulfate. The following wet absorption methods were also developed: gas phase oxidation by chlorine dioxide followed by reduction- absorption by sodium sulfide solution; oxidation-absorption by sodium hydroxide solution of sodium permanganate; oxidation by ozone and absorption by water; oxidation by O3 followed by absorption with diluted sulfuric or nitric acid containing ferric salt; absorption by sulfite solution containing acetate; absorption by calcium chloride (30%) and calcium hypochlorite solution; and absorption by sodium sulfite solution containing catalysts.

52127 **APTIC NO. 74377**

Hirao, M. and S. Yamano

STRUCTURE OF CHIMNEY TOP. *(Entotsu chobu no kozo). Text in Japanese. (Kawasaki Heavy Ind., Co., Ltd., Kobe (Japan)) Japan. Pat. Sho 50-3214. 3p., Feb. 1, 1975. (Appl. Dec. 31, 1970, 1 claim).*

A moisture separator for exhaust gas from factory stacks is described. The exhaust gas, which has been treated by a wet dust collector, contains moisture and the surface of the small water particles adsorbs injurious dust and gases. Generally, the dense distribution of the water particles in the chimney is limited to the vicinity of the inner wall surface. The present device is installed on the top of the chimney so that the smoke which ascends along the inner wall surface is led into the device which condenses the moisture by cooled recoiling fins. The condensed moisture is washed away by the running water in the device, and the moisture free gaseous exhaust exits into the atmosphere.

52128 **APTIC NO. 74296**

Horii, Hidehiro and Takuyoshi Daitoge

REMOVAL DEVICE FOR SOOT IN INCINERATOR EXHAUST GAS. *(Jinkai shokyakuro baien jokkyo sochi). Text in Japanese. (Kusunoki Machinery Manufacturing Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 50-1109. 3p., Jan. 14, 1975. (Appl. Aug. 31, 1971, 1 claim).*

A smoke stack consisting of vertical and horizontal sections with a liquid sprayer at each bend was designed for the removal of sulfur dioxide, hydrogen chloride, soot, and dust contained in incinerator exhaust gas. The upper end of incinerator exhaust outlet is connected to one end of the first horizontal flue, while the other end is connected to a downward vertical flue. The lower end of the vertical flue is connected to one end of the second horizontal flue with spiral wings of net structure on a motor driven shaft, while the other end is connected to the vertical stack and a waste water pipe leading to a receptacle. At each of the three bends of the flue, the cleansing solution is sprayed in the direction of exhaust gas flow for the removal of pollutants by adsorption or dissolution, which also facilitates the flow of exhaust gas. The exhaust gas with reduced flow head by spraying is led out of the flue by the action of rotating spiral wings. By this process, CO, HCl, soot, and dust are removed completely, and only occasionally are traces of SO2 found.

52129 **APTIC NO. 74776**

Hosho, Yukio, Nobushige Oyama, Toshi Suzuki, and Yutaka Nishimura

EFFECT ON AUTOMOBILE EXHAUST OF A WALL ADSORBING STREAM OF AIR RICH FUEL MIXTURE. *(Kihaku kongoki ni okeru hekimen fuchakuryo no haiki eno eikyo). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(2):87-94, 1975.*

The effect of wall adsorbed streams on automobile exhaust of dilute fuel mixture was studied. The relationship between the amount of the adsorption and the particle size of fuel mist was investigated. Particle size smaller than 10 micron diameter was best for homogeneous fuel distribution and the least adsorption on the wall. From 2.5 to 3.5 mm was the most suitable length for the nozzle in thee carbureter to produce a fine mist of fuel. Under normal driving conditions, 260 to 760 mm Hg pressure in the intake tube was observed and the temperature was from 145 to 195 C in this pressure range. The use of a heating system with fins at the bottom of the intake system provides better efficiency of evaporation of fuel in the temperature range 100 to 260 C; this decreases the wall adsorption gas flow and results in less polluted exhaust.

52130 **APTIC NO. 74294**

Ichihara, Shoichi, Shunichi Hara, and Takashi Ohara

COMPLETE OXIDATION CATALYST FOR EXHAUST GAS CLEANING IN INTERNAL COMBUSTION ENGINE. *(Nainen kikan-yo no haiki gasu joka-yo kanzen sanka shokubai). Text in Japanese. (Nihon Catalyst Chemical Industrial Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 50-1718. 4p., Jan. 21, 1975. 2 refs. (Appl. Nov. 27, 1970, 1 claim).*

For the oxidation cleansing of carbon monoxide and hydrocarbons in exhaust gas of internal combustion engine an oxidation catalyst with high activity at low temperature, thermal stability, and durability was developed. The catalyst consists of nickel oxide, chromium oxide, platinum, and activated alumina. The molar ratio of NiO and Cr2O3 is in the range of 1 : 0.5-6, preferably 1 : 1-3, and the total weight of NiO and Cr2O3 corresponds to 5-30% of the total weight of catalyst. The Pt content is 0.01-0.1%, and the rest is activated alumina. The catalysts of various component ratios prepared were tested, and the conversion rates of CO to carbon dioxide and propane to CO2 and water were 2.8-80.2% for CO and 1 15.0% for C3H8 at 200 C, 44.4-99.3% for CO and 20.4-66.8 for C3H8 at 300 C, and 98.0-100% for CO and 78.1-100% for C3H8 at 500 C.

52131 **APTIC NO. 74548**

Ichihara, S., K. Saito, H. Hara, and T. Ohara

A COMPLETE OXIDATION CATALYST FOR EXHAUST GAS TREATMENT IN AN INTERNAL COMBUSTION ENGINE. *(Naien kikan no haiki gasu jokayo kanzen sanka shokubai). Text in Japanese. (Nihon Catalyst Chem.*

Co. Ltd., Osaka (Japan)) Japan. Pat. Sho 50-3758). 4p., Feb. 8, 1975. (Appl. Dec. 3, 1970, 1 claim).

A highly efficient catalytic converter of carbon monoxide and hydrocarbon from automobile exhaust into carbon dioxide and water is described. This catalyst consists of a 5-30% mixture of iron oxide and chromium oxide (in a mole ratio of 1 to 0.5-6) and 0.01 to 0.1% platinum, and the rest a percentage of activated alumina. A 100% conversion efficiency of CO and CH into CO2 and H2O at 500 C was obtained in several experiments.

52132 **APTIC NO. 74516**

Idehara, Shigeyoshi

CONTROL OF NOX FORMATION IN PACKAGE BOILER. *(Pakkage boira ni okeru NOx yokusei taisaku). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(1):89-93, Jan. 1975.*

A single-cylinder, self-circulation package boiler was tested for nitrogen oxides reduction by two-stage combustion, engine gas injection, and the Lesnox method. The boiler had a maximum capacity of 20 tons/hr and a maximum pressure of 22 kg/sq cm G, using a steam injection burner. Second-stage air nozzles were equipped in the surroundings of the pre- combustion chamber and the secondary air was variable from 0 to 60%. For engine gas injection, a mixer was equipped at the entrance of the blower and 20% of the waste gas was recirculated. The Lesnox method mixed small quantities of water and surfactant Lesnox LN-100 with the fuel oil. Two-stage combustion reduced the NOx from 290 ppm to 170 ppm and to 160 ppm when combined with engine gas injection, with C heavy oil as fuel. With a heavy oil, the NOx was reduced from 90 ppm to 60 ppm by two-stage combustion. By engine gas injection, NOx was reduced from 290 ppm to 260 ppm for C oil and from 90 ppm to 40 ppm for A oil. With A oil, the Lesnox method reduced the NOx from 90 ppm to 50 ppm and to 30 ppm when combined with engine gas injection.

52133 **APTIC NO. 74666**

Idehara, S.

PRESENT COMBUSTION TECHNIQUE FOR LOW NOX AND ITS ACTUAL EXAMPLE. *(Genjo ni okeru tei NOx nensho gijutsu to sono jutsurei). Text in Japanese. Kankyo Sono (Environ. Creation), 5(5):38-41, May 1975.*

The Lesnox method and exhaust gas injection (EGI) method were used for nitrogen oxides reduction at Kawasaki Heavy Industries Co. The Lesnox method uses 20% of a mixture of water and surfactant Lesnox-LN-100 in oil as fuel while the EGI method mixes 20% of the exhaust gas into the inlet air. At 20%-100% boiler load, the NOx concentration was reduced from 80-110 ppm to 50-60 ppm the Lesnox method and to 40-60 ppm by the EGI method with A heavy oil as fuel. A combination of the two methods further reduced the NOx concentration to 30-45 ppm. With kerosene as fuel, the Lesnox method reduced the NOx concentration from 70-80 ppm to 30-45 ppm while a combination of the two methods reduced the concentration to about 20 ppm. A new two- stage combustion device, in which the pre-combustion chamber was placed in the wind box and secondary air was supplied to the exit of the chamber, reduced NOx by more than 50% for B and C heavy oil.

52134 **APTIC NO. 74773**

Iida, S.

TRIAL TEST OF HANDY DUST COLLECTOR OF FRP POWDER FROM GRINDER. *(FRP no kenma funjin hoshu sochi no shisaku). Text in Japanese. Hokkaidoritsu Kogyo Shikejo Hokoku (Rep. Hokkaido Prefect. Ind. Exp. Stn.), no. 239:14-20, 1975.*

A trial test of a dust collector for fiber-reinforced plastic (FRP) powder from a plastic grinder is reported. Fine powder of FRP is serious air pollution problem. A simple dust collector for the FRP grinder was built by use of a regular vacuum cleaner which is connected to the hood installed around grinder. This simple device collected 93.3% of FRP dust. Only very small amounts of floating dust were detected in the air. A time- dependent performance test with a 30 and 14 mm diameter hose on the suction line of the vacuum cleaner showed that the larger diameter hose is more efficient.

52135 **APTIC NO. 76739**

Ikeda, Konosuke, Masaru Inaba, and Minoru Tateishi

AN EXHAUST GAS PURIFYING METHOD FOR LIQUID FUEL BATTERY. *(Ekitai nenryo denchi no haigasu joka sochi). Text in Japanese. (Sanyo Electric Co., Ltd. (Japan)) Japan. Pat. Sho 50-15292. 3p., June 4, 1975. 1 ref. (Appl. Nov. 11, 1970, 1 claim).*

A method for the purification of the exhaust gas from a liquid fuel battery using fuels such as hydrazine-ammonia is described. The device comprises a condenser, a dissolving tank, and a neutralization tank. Inclined metal nets are installed in the condenser to increase the contact area. Waste gas containing liquid vapors is introduced into the condenser where most of them are condensed. The resulting gas is led to the dissolving tank where more alkaline hydrazine-ammonia vapors are dissolved. The remaining alkaline gases are neutralized in the neutralization tank and the purified gas, which consists primarily of nitrogen, is released. The device is particularly suitable for a large-capacity battery using liquid fuel.

52136 **APTIC NO. 74769**

Imamura, Sadao

ELIMINATION OF ODOROUS GAS BY DIRECT COMBUSTION. TECHNIQUE FOR THE SAVING OF ENERGY. *(Chokusetsu nensho ho ni yoru akushu gas jokyo. Sho-energy ka ni okeru gijutsu). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 20(5):383-388, May 1975. 5 refs.*

The prevention of odor is very difficult and the lower limit of odor detection varies over a wide range, depending on the nature of the odorous substance. The lowest limit is 0.00016 ppm for ethyl mercaptan and 0.00021 ppm for trimethyl amine. The most fundamental method of odor elimination is the direct combustion. One disadvantage of this method is that it requires the use of high temperatures, accompanied by the loss of heat energy. However, this disadvantage can be overcome to some extent by the use of heat exchanger to preheat the waste gas. Deodorized hot gas can also be used for heating.

52137 **APTIC NO. 76646**

Imamura, Y.

FOUR-CYCLE GASOLINE ENGINE. *(4 saikuru gasorin kikan). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-12533. 3p., May 13, 1975. (Appl. June 30, 1965, 1 claim).*

In the common 4-cycle gasoline engine, the exhaust valve is opened during the ascending piston stroke and closed at the top dead point, while the intake valve is also opened at the top dead point. However, the closing of the exhaust valve and the opening of the intake valve overlap, and the exhaust gas and fuel-air mixture come in contact resulting in the diffusion of these two gases. As a result, a small amount of exhaust gas is left in the fuel-air mixture, which deteriorates the engine efficiency. In the 4-cycle engine of this invention, for the purpose of reducing the amount of residual exhaust gas by means of diluting exhaust gas, fresh air is led into the exhaust port during the abovementioned overlapping time. The fresh air inlet is located in the exhaust port. With the opening of the exhaust valve and discharge of exhaust gas at high speed, the pressure in the fresh air inlet drops and fresh air is led into the exhaust port, diluting the exhaust gas in the immediate area and thus reducing the amount of residual exhaust gas in the fuel-air mixture.

52138 **APTIC NO. 74542**

Imaya, Naruo

DIRECT COMBUSTION DEODORIZATION APPARATUS WITH A WATER TRAP FOR BACK-BURNING PREVENTION. *(Suifu gyakka boshi gata chokka shiki dasho sochi ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(3):95, 1975.*

A structural counterplan for safety and running cost in a currently used direct combustion deodorization apparatus is reviewed. The dilution method and the water trap method as additional safety methods are compared with respect to the concentration of inflammable gas and calorific value of the treated gas when using methanol gas. The lower running cost of the water trap method is emphasized when calorific values are greater than 120-130 kcal/N cu m of treated gas. The scale of the deodorization furnace and the stack height are also compared, and lower initial cost is expected in the water trap method.

52139 **APTIC NO. 74837**

Inaba, Yoshinari

OPERATIONAL DATA ON DRY TYPE 10,000 NORMAL CU M/HR FLUE GAS DENITRIFICATION PROCESS AT HITACHI ZOSEN CO. *(Kanshiki 10,000 kado deta, Hitachi Zosen). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(2):31-36, Feb. 1975.*

A pilot plant treating 10,000 normal cu m/hr of boiler gas with a selective catalytic reduction denitrification process is described. The process uses a D-type catalyst with ammonia as the reducing agent. Boiler gas containing 350 ppm nitric oxide and 100 ppm sulfur dioxide is treated at 250-400 C at a space velocity of 2500/hr. At an NH3 concentration of 520 ppm, the NO concentration is reduced to below 10 ppm. For gas containing 500 ppm and 300 ppm SO2, the rate of denitrification ranges from 63% at an NH3/NO ratio of 1.25 to more than 95% at an NH3/NO ratio of 2.45 for a space velocity of 20,000/hr. Increasing the space velocity permits the use of a smaller reactor and less catalyst but increases pressure loss on the catalyst layer and results in a shorter catalyst life.

52140 **APTIC NO. 74907**

Inagaki, Kineo

ODOR ELIMINATION BY MEANS OF CATALYTIC OXIDATION. *(Sesshoku sanka-ho ni yoru akushu boshi gijutsu). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 20(5):389-394, May 1975. 6 refs.*

The catalytic oxidation of odorous substances with platinum group catalysts and transition elements is discussed. By the use of platinum, platinum-rhodium alloy, and platinum-palladium catalysts, it is possible to decompose or oxidize odorous substances at 300-400 C, whereas oxidation by simple combustion of these odorous substances takes place at 700-800 C. The main difficulty with these catalysts is the elimination of catalyst poisons prior to the treatment. Halogens and fumes of lead, tin, zinc, antimony, and mercury must be removed before they come into contact with the catalyst. Phosphorus, organometallics, and arsenic are also catalyst poisons. Some substances are odorous even at ppb concentrations. In the treatment of these, it is necessary to repeatedly pass the gas through the catalyst layer. The most important transition elements used as catalysts are copper, manganese, or iron and their compounds. Mixtures of oxides are often used as catalysts. Silica gel and activated carbon are often used as catalyst carriers. Alumina, zeolite, and activated carbon are also used as catalysts.

52141 **APTIC NO. 74342**

Inoue, Katsuya and Tatsuo Ishikawa

FERRIC OXYHYDROXIDE AS SO2 ABSORBENT. *(SO2 kyuchaku zairyo to shiteno insuisankatetsu). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 26(6):587-592, June 1975. 13 refs.*

Alpha-, beta- and gamma-ferric oxyhydroxide(FeOOH) were used for sulfur dioxide absorption. Ferric oxyhydroxide was degased at 110 C for 13 hr and then SO2 was passed over the absorbent at various pressures. The increase in weight was measured for about 2 hr until a constant weight was obtained. The absorbed SO2 was repeatedly washed with water and was determined as sulfate ion by using Arusenazo III solution as the indicator. The absorptions were 0.23-0.29 mg/sq m for alpha-FeOOH, 0.26 mg/sq m for gamma-FeOOH, and 0.37-0.40 mg/sq m for beta-FeOOH for ambient SO2 concentrations between 0.5% and 0.9%. The addition of copper sulfate changed the crystallinities and the SO2 absorption ability of the three types of FeOOH. Beta-ferric oxyhydroxide showed the highest SO2 absorption at 6% copper, and alpha-FeOOH showed increasing SO2 absorption from 1% Cu to 7% Cu.

52142 **APTIC NO. 74716**

Ishiguro, Tatsukichi

PRESENT STATUS OF POLLUTION CONTROL. *(Akushu kogai boshi no genjo). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(4):58-61, 1975.*

The present status of control regulations and technology in Japan is surveyed. By February 1975, 40 prefectures and 9 major cities had designated areas for atmospheric control, according to regulations promulgated in October 1974. Six other prefectures have yet to specify control regions. Odor control technology can be divided into four major methods: direct combustion, catalytic oxidation, adsorption, and liquid reagent oxidation or absorption. Direct combustion has been the preferred treatment method up to now, but with the development of catalysts and adsorbents, catalytic oxidation and adsorption methods are gaining ground. Many installations contain suitable combinations of these methods. Gas treatment facilities for all methods have capacities mostly in the range of 1000-10,000 N cu m/hr. Recently, many installations with treatment capacities above 20,000 N cu m/hr have been developed.

52143 **APTIC NO. 76642**

Ito, Hiroshi and Masuhiro Matsuuchi

A METHOD AND EQUIPMENT FOR FACILITATING COMPLETE COMBUSTION OF THE INTERNAL COMBUSTION ENGINE, INCREASING POWER, AND REDUCING TOXIC GAS IN EXHAUST. *(Nainen kikan no kanzen nensho o sokushin shi shutsuryoku o mashi, haiki chu no yugai gasu o gensho seshimeru hoho oyobi sono sochi). Text in Japanese. (Sakai Shoji K.K. (Japan)) Japan. Pat. Sho 50-11003. 5p., April 26, 1975. 1 ref. (Appl. April 30, 1968, 2 claims).*

Methods and equipment for facilitating complete combustion of internal combustion engines were developed. In the final stage of the exhaust stroke and the initial stage of the intake stroke of internal combustion engines, the openings of the intake valve and exhaust valve are overlapped, and negative pressure is produced in the exhaust pipe connected to the cylinder, allowing the back-up of exhaust gas into the cylinder. In the method of this invention, an air supply cylinder equipped with a one-way valve which opens with negative pressure in the exhaust pipe and an air intake cap with air filter layer and cooling fins around the outer wall is attached to the exhaust pipe immediately after the exhaust valve. By this mechanism, the fresh air rather than exhaust gas is fed back into the cylinder, thereby facilitating the complete combustion, increasing output power, and reducing toxic substances in the exhaust gas. For example, in the case of installing four air supply cylinders to an eight cylinder engine, the carbon monoxide concentration before and after the installation were 12.2% and 6.3% for car A and 9.4% and 4.0% for car B.

52144 **APTIC NO. 74486**

Iwami, H.

WET SYSTEM CAUSTIC SODA ROTATION CLEANING METHOD. *(Shisshiki kasei soda kaiten seijoho). Text in*

Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27( ):23-26, June 1975.

The installation of a wet type caustic soda rotation cleaning method for treating emissions from two boilers (9000 kg/hr and 3000 kg/hr) whose fuel contains 3.0 wt% sulfur is described. The control equipment is capable of a more than 95% desulfurization efficiency. Since the start of operation, both sulfur oxides and dust are lower than planned figures, and the concentration of SOx after treatment remains below 50 ppm. Before treatment SO2 is 1000 ppm and after treatment 35 ppm. Dust after treatment is 0.07 g/normal cu m. Caustic soda from the plant s dyeing process is utilized when caustic soda in the effluent is insufficient. A caustic soda solution of 48% is automatically supplied. Further improvements required include eliminating dew formed in the flue and preventing corrosion of the stack. The most troublesome problem is the maintenance of SO2 analyzing equipment and the pH meter.

52145 **APTIC NO. 74374**

Juentgen, Harald and Karl Heinrich van Heek

COAL GASIFICATION UTILIZING HEAT FROM HIGH TEMPERATURE NUCLEAR REACTORS WITH SPECIAL CONSIDERATION OF THE ROLE OF THE REACTOR OUTLET TEMPERATURE. *(Kohlevergasung unter Nutzung von Waerme aus Hochtemperatur-Kernreaktoren unter besonderer Beruecksichtigung der Rolle der Reaktoraustritts-temperatur). Text in German. Kerntechnik, 17(4):181-187, Jan. 1975. 26 refs. (Also: Glueckauf, 111(8):379-381, April 1975. 17 refs.)*

By utilizing process heat from gas cooled high temperature reacters valuable coal can be saved for the coal gasification process itself The advantages of this include lower gas production costs than with conventional processes, a reduction in coal consumption, and a reduction in carbon dioxide emissions. Methane production costs using a German high volatile coal can be cut by about 25%, coal consumption by about 40%, and CO2 emission by about 30%. The main problems associated with the large scale application of nuclear energy to coal gasification include: the development of high temperature nuclear reactors with a helium oulet temperature of at least 950 C; the transfer of the heat from the core of the nuclear reactor to the gas generator; and the design of a suitable allothermic gas generator in which the gasification kinetics, heat transfer, and materials available for the heat exchanger can be taken into account. Experiments carried out to solve the last two problems are discussed in detail.

52146 **APTIC NO. 76733**

Kamata, Rinpei and Shozaburo Yoshikawa

AN SO2 GAS ABSORBER USING WASTE ASBESTOS, SERPENTINE, AND OLIVINE. *(Ishiwata haiseki, jamongan oyobi kanran-gan o riyo shita SO2 gas kyushuzai). Text in Japanese. (Hokkaido (Japan)) Japan. Pat. Sho 50-10275. 6p., April 19, 1975. (Appl. May 12, 1969, 1 claim).*

Various absorbents for the removal of sulfur dioxide emissions from boilers are described. The absorbents were prepared from waste asbestos stone, serpentine, or olivine. Waste asbestos stone, which contained mainly serpentine, was crushed into particles 1 mm in size, and the magnetite and chromite were removed with a magnetic selector. The particles were fired at 650 C for 1 hr and were ground to 200 mesh. The sample absorbent (20 g) was mixed with 5 ml water and the mixture was granulated and packed in a vinyl tube. Gas containing 1.72% SO2 was passed through the vinyl tube for about 6 hr at 100-130 ml/min. A 100% removal of SO2 was achieved.

52147 **APTIC NO. 74480**

Kammholz, H. and E. Cerwenka

REDUCTION OF THE POLLUTANT EMISSION FROM INCINERATORS BY DRY SCAVENGING. *(Verminderung der Schadgasemissionen von Muellverbrennungsanlagen durch Trockenwaesche). Text in German. VGB Kraftwerkstechnik, 55(4):234-239, April 1975. 13 refs.*

The additive mytrid, a caustically burned magnesite with a porous structure to provide a large surface area (fineness: 90% below 90 micron, at least 80% below 60 micron, and at least 70% below 40 micron; specific surface of 15 to 20 sq m/q), was injected into the combustion chamber of an incinerator. The emission of following pollutants from a treated and untreated combustion unit was measured: hydrogen chloride, hydrogen fluoride, sulfur dioxide and trioxide, and the oxides of nitrogen. Each of the two units had a trash throughput of 19 tons/hr. The effect of the additive on the pollutant emission was determined from the difference between the measured pollutant concentrations in the waste gases from the two units. The results are graphically illustrated. With regard to the emissions SO2, SO3, HCl, and HF, mytrid had a reducing effect; no effect was observed with regard to the emissions of oxides of nitrogen. The composition of the fly ash from the two units hardly differed. The dust concentration of the cleaned gas did not increase. Further long-term measurements are required.

52148 **APTIC NO. 74846**

Karasuyama, N., K. Sugito, S. Kobayashi, and J. Mimura

DRYING OF HOG FECES IN VINYL HOUSES AND THE DEODORIZATION EQUIPMENT. *(Vinyl house in yoru tonpun no kanso to sono dasshu sochi). Text in Japanese. Tokyo-to Chikusan Shikenjo Kenkyu Hokoku (Res. Rept. Anim. Husb. Exp. Stn. Tokyo), no. 14:83-87, March 1975.*

A system for deodorizing emissions generated by the drying of hog feces is described. A deodorizing tower is installed next to the drying house. A fan, 40 cm in diameter, directs the odorous air to the tower. The tower is 2.5 m high and 40 cm in internal diameter. The tower is made of vinyl. The deodorizer in the tower consists of wood vinegar plus bacteria which perform photosynthesis. The tower is also filled with polypropylene spheres which are used to increase the effective contact area between the deodorizer and the odorous gas. The consumption of the deodorizer is 24-55 l/day. The percentage of ammonia removal is about 29.2-70.9%, depending on the conditions of the day. For the removal of water from the feces, 12 days are necessary to reduce the water content to about 60%.

52149 **APTIC NO. 74876**

Karasuyama, N., H. Okuyama, K. Sugito, and S. Kobayashi

DRYING AND DEODORIZATION OF COW FECES BY FIRE DRIVEN DRIER. *(Karyoku kansoki ni yoru gyufun no kanso to dasshu). Text in Japanese. Tokyo-to Chikusan Shikenjo Kenkyu Hokoku (Res. Rept. Anim. Husb. Exp. Stn., Tokyo), no. 14:89-94, March 1975.*

A system for the drying and deodorization of cow feces was evaluated. The fecal material to be dried was charged in a rotating drum which was heated by a flame from the outside. The amount of feces treated was 212 kg of raw feces/hr. The dried product was obtained at a rate of 111 kg/hr. The gas emitted by the drier was washed with water to remove the odor. The consumption of washing water was 594 l/hr. No hydrogen sulfide was detected in the treated gas. The ammonia concentration was 9-150 ppm. Preliminary drying of the feces on concrete was especially important.

52150 **APTIC NO. 74975**

Kasaoka, N.

CATALYST IN DRY DENITRIFICATION AND FUTURE PROBLEMS. *(Kanshiki dassho no shokubai to kongo no mondai). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(6):81-88, June 1975. 8 refs.*

Dry dentrification methods for the simultaneous purification of nitrogen oxides and sulfur oxides were examined. Experiments were conducted using copper, iron, cobalt, nickel,manganese, titanium, vanadium, molybdenum, silver, platinum, rhodium, and palladium as major catalysts, having as carriers alumina, silica, silica- alumina, magnesium oxide, calcium oxide, chromia, and activated coal. Carbon monoxide, hydrogen, hydrocarbons, hydrogen sulfide, and ammonia were used as reducing gases. For purification of NO_x only, by reduction with NH_3, sulfate catalysts were useful. Denitrification by this method is the same whether or not SO_x coexist. Dusts in gases catalytically treated must be first removed. Without providing dust collector before denitrification, large catalysts must be used, or catalysts of ring shape can be used; catalyst columns may also be improved. For clean gas, with very little SO_x present, there is negligible change in carriers like Al_2O_3 with time. Experiments on catalysts rejuvenation were also carried out at about 750 C.

52151 **APTIC NO. 74341**

Katafuchi, K. and H. Arai

CATALYTIC COMBUSTION TYPE DEODORIZATION APPARATUS FOR FLUE GAS. PART 1. *(Haigasu sesshoku nensho-shiki dasshu sochi I). Text in Japanese. Insatsu Zasshi (Print. J.), 58(4):41-45, April 1975.*

A catalytic combustion flue gas deodorization apparatus that utilizes the heat of combustion of the flue gas is described. A metal heat reservoir is used as the heat exchanger and the catalytic combustion is carriedd out in the heat reservoir with metal or fire brick as the catalyst. A temperature adjusting chamber is used for diverting combustion gas when overheated, and a cooling system is used to prevent overheating of the catalytic materials. The combustion can be carried out without additional fuel when the toluene concentration of flue gas is over 400 ppm. The apparatus saves up to 75% of the fuel required for a conventional catalytic combustor and up to 90% of that required for direct combustion. The catalyst processes a long life and a stable conversion rate.

52152 **APTIC NO. 74485**

Kato, S.

WET SYSTEM CAUSTIC SODA CIRCULATION METHOD. *(Shisshiki kasei soda junkanho). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(6):17-21, June 1975.*

Daiichi Carbon Company, which produces 55% of the carbon stick used for dry batteries as well as carbon for movie projectors, installed wet caustic soda circulation type desulfurization equipment on its boiler and furnace in August 1973. Caustic soda is added in relation to the sulfur content of the fuel. The waste liquid, which contains sulfur, is removed by a batch process daily. Caustic soda is separated and recovered for use again. Recycling the caustic soda reduces the running cost. However, the recycling process is time-consuming and requires expensive equipment. Waste gas from the boiler is 200-300 C, and it must be precooled and cleaned of dust. Absorption takes place at about 60-80 C at a pH around 7 to 8. The concentration of sulfur dioxide in the gas is reduced to less than 50 ppm. As sodium bisulfite is formed, the pH of the absorbing liquid is reduced. The desulfurization effect is extremely reduced at pHs lower than 5. All of the processes, except residue removal from the filter press, are fully automated. The process can be applied to a variety of waste gases. It may be unsuitable, however, for very small plants, using boilers of 5 tons/hr or less. It is possible to recover calcium sulfite as gypsum, though it is difficult to turn out gypsum of good quality which is economically attractive for small plants.

52153 **APTIC NO. 74549**

Kawamoto, M. and T. Ogawa

SULFUR DIOXIDE GAS REMOVAL METHOD. *(Aryusan Gasu Jikyoho). Text in Japanese. (Mitsubishi Kasei Ind. Co. Ltd., Tokyo (Japan)) Japan. Pat. Sho 50-6439. 5p., March 13, 1975. (Appl. July 9, 1971, 1 claim).*

A method of removing sulfur dioxide gas in the waste gas from metal mining or chemical factories is described. This device uses ammonium phosphate as an adsorbent. The adsorbent, $(NH_4)_2H_2PO_4$, reacts with SO_2 and creates ammonium sulfate. Advantages of this device include high cleaning efficiency and extremely low running cost, as well as the production of useful fertilizer. An activation of the adsorbent can easily be performed by adding more ammonium. A maximum of 99.9% efficiency was achieved.

52154 **APTIC NO. 74376**

Keller, A.

FLUE GAS FILTERS FOR OIL HEATERS. *(Rauchgasfilter bei Oelfeuerungen). Text in German. Oel Gasfeuerung, 20(4):212-214, 1975.*

Flue gas filters help to reduce emissions of iron oxides, soot, and dust from oil heaters without eliminating the causes leading to these emissions. The installation of such filters can result in negative consequences such as higher heater failure rate, efficiency loss and resultant increased oil consumption and environmental pollution, additional service costs, increased noise, and higher power consumption. Emissions which can be reduced with such filters are better controlled by the installation of boilers with a burner operating phase that lasts at least 4 min and by adequate design of the chimney.

52155 **APTIC NO. 74937**

Kirsch, H. and R. Geschner

RESULTS OF CO MEASUREMENTS ON MOTOR VEHICLES BEFORE AND AFTER SLOW RUNNING ADJUSTMENT TO LOWER EMISSIONS OF HARMFUL AGENTS. *(Ergebnisse von CO-Messungen an Kraftfahrzeugen vor und nach schadstoffarmer Leerlaufeinstellung). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(1):27-29, 1975. 63 refs.*

Of 1324 vehicles tested, 776 (58%) exceeded the maximum emission concentration values of 4.5% carbon monoxide. Objections were raised against 437 (69%) of the 638 vehicles with four-stroke engines examined. Of the 686 vehicles with two-stroke engines, 339 (49%) exceeded the maximum emission concentration value. Slow running adjustments were made on these vehicles to reduce the emission of harmful substances. The average CO-emission of all vehicles examined was 4.9 vol% before and 1.8 vol% after adjustment of the carburetor.

52156 **APTIC NO. 74964**

Kitao, Y.

ON THE SAVING OF FUEL BY ZONE HEATING. *(Chiiki danbo ni yoru nenryo setsuyaku ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(2):97-113, Feb. 1975. 6 refs.*

The economical use of heat energy caused by the petroleum crisis in 1973 produced a need for zone heating. The progress and present state of zone heating, its economic advantages, and its reduction of fuel consumption are analyzed. Plans for zone heating and cooling (June, 1973), the merits of zone heating, a comparison of zone heating with other methods, the efficiency and vaporization ratio of various kinds of boilers, the efficiencies of small boilers, and examples of heat and electric generators (power plants) are also reviewed.

52157 **APTIC NO. 74976**

Kobayashi, Shinji, Nobuo Iwai, Masatake Furuta, Hideo Sudo, and Takahiro Tsuruga

STUDIES ON METHANOL ENGINES FOR AUTOMOBILES. EXAMINATIONS ON THE OPTIMUM COMPRESSION RATIO. *(Jidosha-yo methanol kikan no kenkyu. Saiteki asshuku-hi no kento). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 105-108, 1975. 5 refs. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

The optimum compression ratio for a methanol engine was investigated. The engine temperature was kept constant by external heating because the heater capacity was insufficient when methanol or hydrated methanol was used. The octane value of methanol itself was 89.5. The value increased as the water to methanol ratio (by volume) was increased. The knocking limit compression ratio of the methanol engine was higher than that of a gasoline engine by about 0.8-1.4. The antiknocking property did not change with the addition of water up to a water fuel ratio of 30% at the time of maximum power output. When the engine was driven at a high compression ratio with delayed ignition under dilute conditions, it was possible to significantly decrease the amount of nitrogen oxides discharged. This method was very economical because the heat efficiency did not deteriorate.

52158 **APTIC NO. 74643**

Koga, Noboru

A CYCLONE SEPARATOR. *(Saikuron bunriki). Text in Japanese. (Naigai Denki Kogyo K. K. (Japan)) Japan. Model Util. Sho 50-15662. 2p., May 15, 1975. (Appl. April 28, 1971, 1 claim).*

A cyclone separator with double cyclone bodies designed for efficient separation of smaller dust particles and aerosols is described. A cone-shaped inner cyclone body with numerous holes is placed in a cone-shaped outer cyclone body which is connected to the gas outlet chamber at the upper end and the dust collector hopper at the lower end. A cylinder with open ends laced in the center of inner cyclone body is connected to the gas outlet chamber through the outer cylinder opening and is attached to the regulator plate. The cylinder can be moved vertically. The flow rate of the gas in the outer cyclone body is regulated by vertical adjustment of the regulator plate placed over the opening; this in turn regulates the vortex velocity in the inner and outer cyclone bodies for the most efficient dust separation.

52159 **APTIC NO. 74378**

Kojima, Toshihiko

CATALYST FOR CLEANING HARMFUL GASES IN INTERNAL COMBUSTION ENGINES. *(Nainen kikan haiki yugai gasu jokayo shokubai). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-8036. 3p., April 4, 1975. (Appl. Nov. 14, 1970, 1 claim).*

An economical and efficient catalyst for automobile exhaust cleaning is described. The catalyst is prepared from copper oxide and 2-6% nickel. The geometrical shape of the catalyst is especially important. In order to provide longer life time and larger contact surface between the catalyst and treated gases, the catalyst is shaped as a rod with a screw thread, or with a screw thread and holes which are located at equal intervals. This device can be installed at any place in the exhaust system, muffler, or exhaust pipe. Removal rates of 98% for carbon monoxide and 90% for hydrocarbon were achieved by the rods with screw thread and holes under conditions off200-250 C exhaust gas temperature.

52160 **APTIC NO. 74541**

Koyama, H.

NITROGEN OXIDES CONTROL MEASURE BY FUEL CONVERSION: FROM HEAVY OIL TO NAPHTHA. *(Nenryo tenkan ni yoru NOx yokusei taisaku: jyuyu kara nafusae). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(5):25-27, 1975.*

Nitrogen oxides formation in fuel combustion decreases in the order coal, heavy oil, crude oil, kerosene, naphtha, and LNG (liquefied natural gas). Light fuels generate less NOx due to their low N content, lower flame temperature resulting from lower heat evolution per unit column of fuel, and low oxygen combustion. A 200 MW boiler at Chubu Power Plant was tested for the effect of fuel conversion from heavy oil to naphtha. The conditions for combustion remained the same and the NOx concentrations were monitored by a Dyna Science Monitor. Preliminary results showed that NOx concentration was reduced by about 36%. Two 700 MW boilers with LNG fuel were installed with the expectation that the NOx concentration would be reduced to about 50 ppm.

52161 **APTIC NO. 74504**

Kumazawa, M., H. Yada, S. Toyoda, H. Okura, S. Kikkawa, S. Maruko, K. Kato, and M. Seki

RECOVERY SYSTEM FOR CHEMICAL PLANT WASTE: CLOSED CYCLE SYSTEM. *(Kagaku puranto ni okeru haishutsu butsu no kaishu sochi: Kurozodo saikuru ka). Text in Japanese. Hitachi Hyoron, 57(3):201-206, March 1975. 3 refs.*

Closed cycle recovery systems for hydrochloric acid from industrial waste containing organic chloride and sulfur from flue gas containing hydrogen sulfide were developed jointly by the Hitachi and Amoco Corporations. The HCl recovery system consisting of combustion process (HCl and chlorine gas formation), quencher system, HCl gas absorption process, and exhaust gas cleansing process (removal of toxic substances, HCl less than 5 ppm, Cl_2 less than 1 ppm) is described with an explanation of the process and procedure and flow sheets. The plant specifications and operation record of HCl recovery systems installed at Showa Denko Co. are given; the stable and reliable operation is evident from these figures (emission concentration of HCl, 1.4 ppm, Cl_2, 0.2 ppm). For S recovery, three types of processes are used; total flow process (straight through system, H_2S concentration above 45%), tributary process (split flow, H_2S concentration 15-45%), and direct oxidation process (H_2S concentration less than 15%). The S recovery system consisting of reactor furnace, boiler condenser, secondary reactor, sulfur storage tank, and incinerator is described with procedure and operation records (S recovery rate 94.5%).

52162 **APTIC NO. 74895**

Kurosawa, Keiji

DESULFURIZATION, DENITRIFICATION, AND ENERGY SAVING. *(Sho-enerugi to datsuryu, dassho). Text in Japanese. Preprint, Japan Management Assoc., Tokyo, p. 73-88, 1975. (Presented at the Japan Management Association Symposium on Pollution Engineering, Tokyo, Japan, March 17, 1975.)*

The compromise between energy saving and pollution control is discussed. About 4-10% of fuel is spent solely for desulfurization; for example, 8-10% of the heavy oil is consumed for direct desulfurization, 5-6% for indirect desulfurization, and 4-5% for desulfurization of smoke. The economy of desulfurization is also discussed from the viewpoint of construction costs of desulfurization plants. The reduction of nitrogen oxides also consumes additional oil. Improvement in the combustion method is the most economical control. Examples of such control include: combustion under low oxygen, recirculation of discharged gas, two-stage combustion, a lowering of the preheating temperature of air, and the spraying of water into the flame. Removal of NOx by dry methods can be achieved also. A typical method is the catalytic reduction of NOx with ammonia. However, an amount of ammonia equivalent to about 1 million tons of ammonium sulfate must be consumed for NOx removal if this method is to be exclusively adopted in Japan.

52163 **APTIC NO. 74667**

Kusama, A.

CONTROLLING TECHNIQUE WITH FUEL OF GOOD QUALITY. *(Nenryo no ryoshitsuka ni yoru seigyo gijutsu). Text in Japanese. Kankyo Sozo (Environ. Creation) 5(5):29-32, May 1975.*

Nitrogen oxides in combustion gas consist of fuel NOx resulting from nitrogen compounds in fuel and thermal NOx resulting from high temperature combustion of N_2 in air. Thirty to

50% of the organic nitrogen compounds in fuel are converted into NOx by combustion. Coal generally contains 0.7-1.6% nitrogen compounds while heavy oil contains 0.14-0.38%. Gas fuel, which contains none or very few nitrogen compounds, is an ideal substitute for coal and oil. In addition to the advantage of low NOx emission, gas also produces less particulates, carbon monoxide, and hydrocarbon, and gives more stable flame. Two-stage combustion on the average reduces 36% of the NOx in combustion gas with heavy oil as fuel but reduces 57% of the NOx with natural gas as fuel. Up to 65.5% of NOx are reduced by exhaust gas recirculation with gas fuel as compared to 34% with heavy oil. A high speed gas burner developed by Tokyo Gas Works having a maximum combustion load of 170 million kcal/cu m hr reduced the NOx concentration to 60-70 ppm.

52164 **APTIC NO. 74952**

Loehner, Kurt and W. Bohlmann

HYBRID DRIVE OF MOTOR VEHICLES WITH INTERNAL COMBUSTION ENGINE AND BUFFER BATTERY FOR URBAN TRAFFIC. *(Hydridantrieb eines Kraftfahrzeugs mit Verbrennungsmotor und elektrischem Puffer unter besonderer Beruecksichtigung des Stadtverkehrs). Text in German. Motortech. Z. (Stuttgart), 36(3): 79-84, 1975.*

Studies were made to determine whether lower exhaust emissions could be obtained with a hybrid drive engine with Otto-engines, electrical batteries and electro-motors. Calculations were based on the CVS-, the California-, and the Europa-cycle, where an air-cooled Otto-engine and a lead-free fuel were used, but only with a 75 compression ratio and a relatively high fuel comsumption. Without exhaust gas recirculation, the nitrogen oxides emission of the passenger car with direct drive is independent of the piston displacement of the engine at 1.1 g/mi, with hybrid drive much more adverse. By exhaust gas recirculation, the NO-emissions can be reduced to 0.6 g/mi. The NO-emission of the delivery truck can be reduced to 1.05 g/mi by exhaust gas recirculation; without it is at 2.5 g/mi. With hybrid drive, the emission of carbon monoxide can be reduced 70%, the hydrocarbon emission to 55%, but that no NO reduction can be attained.

52165 **APTIC NO. 74487**

Maejima, H.

DESIGNING AND ACTUAL EXPERIENCE OF DESULFURIZATION EQUIPMENT OF STACK SMOKE. *(Haien datsuryu sochi no sekkei to sono jissai). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(6):10-16, June 1975.*

Trends in the installation of stack gas desulfurization equipment throughout Japan are reported and discussed in relation to new sulfur oxide standards. Installation plans of 10 power companies as well as of major industries are given. There will be 188 installations by 1977, including both dry and wet types. Dry type equipment requires a long reaction period, much absorbent, and a relatively large space. Wet type processes have been used by the chemical industry for a long time. Depending upon the absorbent (caustic soda, sulfuric acid soda, lime slurry, ammonia), by-products such as sulfuric acid and gypsum are obtained. Absorption in wet type processes is quicker than in dry types, with a smaller absorption area being required; desulfurization effect is greater. Wet processes are more popular than dry types. Closed methods are desirable to avoid pollution by effluents. Although so far it is impossible to eliminate nitrogen oxides and sulfur oxides simultaneously, equipment for this purpose is under development, but has not reached the practical stage yet.

52166 **APTIC NO. 74806**

Masaki, Kenji and Ohgyo Maruoka

A DEVICE FOR CONTROLLING AIR-FUEL RATIO AT DECELERATION OF AUTOMOBILE. *(Jidosha no gensoku doki ni okeru kunenhi seigyo sochi). Text in Japanese. (Nissan Motor Co., Ltd. (Japan)) Japan. Model Util. Sho. 50-19051. 4p., June 10, 1975. (Appl. March 30, 1968, 1 claim).*

A control device was designed for the purpose of reducing emissions of hydrocarbons and incompletely ozidized fuel gas during deceleration by means of adjusting the air-fuel ratio. The HC emission can be reduced by decreasing the air-fuel ratio (e.g., 12-13). Therefore, the control device is designed to reduce the ratio of air during deceleration in order to facilitate complete combustion by increasing the ratio of fuel. In the slow system of a carburetor with three air bleeds, Al, A2 and A3, the opening and closing of A3 is controlled by an electromagnetic valve and diaphragm system actuated by the marked increase in intake negative pressure during deceleration. A suitable air-fuel ratio is set at idling, and A3 is closed during deceleration, allowing an increase in the fuel ratio.

52167 **APTIC NO. 74642**

Masamoto, Yasusada

A CONTROLLING DEVICE FOR EVAPORATION LOSS FROM AUTOMOBILE GASOLINE TANK. *(Jidosha yo gasorin tanku kara no johatsu rosu contorolu sochi). Text in Japanese. (Daihatsu Kogyo Co., Ltd. (Japan)) Japan. Model Util. Sho 50-18008. 2p., June 3, 1975. (Appl. April 30, 1971, 1 claim).*

A device for reducing evaporation losses from gasoline tanks for two-cycle compression engines is described. A valve system consisting of a rubber valve head operated by a spring and valve seats on both sides of the rubber head is placed in a pipe connecting the intake pipe at the downstream end of throttle valve and the space in the gasoline tank. The valve case is also connected to the clean side of air cleaner by means of a small tube which supplies air into the gasoline tank while in engine operation. The valve opens the route when the negative pressure in the downstream end of the throttle valve reaches a certain value (e.g., 10 mm mercury), allowing the passage of gasoline vapor into the crankcase (where it is stored until the engine ignition) and into the tube leading to the air cleaner. The valve closes at a higher negative pressure (e.g., 30 mm Hg) when the engine is in operation, allowing only the passage of air from the air cleaner to the gasoline tank. The gasoline evaporation loss is reduced by storage of the vapor in the crankcase.

52168 **APTIC NO. 74665**

Masuda, N.

PRESENT STATE OF LOW NOX BURNERS AND THEIR ACTUAL EXAMPLES: DAIDO-CALORIC BURNER FOR LOW NOX. *(Genjo ni okeru tei NOx bana to sono jitsurei: tei NOx yo daido caroric bana ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(5):47-51, May 1975.*

Daidocaloric burners (R-I, RO-I, and RO-II) for low nitrogen oxides combustion are described. The burners utilize high speed air through ring nozzles, which reduces the pressure in the fuel-supplying chamber and causes flue gas recirculation from the combustion chamber. The burners show the following characteristics of nitric oxide prevention: short combustion time due to intensive pre-combustion at high temperature; no NO formation since local high temperature combustion of carbon particles does not occur; and no local high temperature combustion of fuel. The burners can be used for gas combustion with urban gas, methane and liquefied petroleum gas and oil combustion with A heavy oil, and kerosene. Two 400,000 kcal/hr RO-II burners using A-oil gave 52-53 ppm NOx concentration in the combustion gas at 800 C combustion temperature and 74-75 ppm at 900 C combustion temperature. Comparison with a conventional burner revealed that Daidocaloric burner reduced almost 50% of the NOx.

52169 **APTIC NO. 74819**

Matsui, Hiroshi, Genzo Hashizume, and Minoru Tanaka

ALPHA-TYPE HEMIHYDRATE GYPSUM SYNTHESIS IN THE STACK GAS DESULFURIZATION PROCESS USING LIME-GYPSUM METHOD. *(Sekkai-sekko ho haien datsuryu kotei deno arufa gata hansui sekko ho no gosei, 2, kakushu tenkazai no koka). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 803, 1975. 1 ref. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2009.)*

The effects of various crystallizing agents and oxidizing agents on the formation of alpha-type hemihydrate gypsum were studied. Crystallizing agent ane metal oxide were added to 2.5 g of raw material and 450 ml of water and oxidation was carried out at 130 deg, 2 kg/sq cm pressure, and pH 3.0. The concentration of organic salt and inorganic salt as crystallizing agent were 0.1% and 0.2%, respectively, and the concentration of metal salt as oxidizing agent was 0.1%. The products were analyzed by differential thermal analysis, X-ray diffraction, and microscopy. With sodium succinate and inorganic salts such as aluminum sulfate, chromic sulfate, and aluminum chloride as crystallizing agent, the reaction was completed in 1-1.5 hr with the formation of alpha-type hemihydrate gypsum, while the sodium tartrate, ammonium citrate, monosodium fumarate and sodium citrate, the reaction required 2 hr. With the addition of metal salts such as iron sulfate, nickel sulfate, and copper sulfate in addition to ammonium citrate or sodium citrate the reaction was completed in 1 hr and needle crystals were formed.

52170 **APTIC NO. 74831**

Matsumoto, Akira

EXAMPLES OF NOX CONTROL IN INDUSTRIAL BOILERS. *(Sangyo yo boira ni okeru NOx taisaku Jisshi rei). Text in Japanese. Boira Kenkyu (J. Japan Boiler Assoc.), no. 150:22-24, April 1975.*

Nitrogen oxides emission control for small industrial boilers by means of exhaust gas injection (EGI) and two-stage combustion (TSC) is described. The formation of thermal NOx is reduced by EGI by lowering flame temperature. The NOx formation is controlled by TSC by reducing oxygen partial pressure and thermal NOx and fuel NOx are simultaneously reduced by lowering the maximum combustion temperature. The boiler specifications, NOx control system, and air control device are described with flow sheets. The NOx emission data obtained for heavy oil C (C) and heavy oil A (A) are NOx concentration 245 ppm (C) and 150 ppm (A), thermal NOx 120 ppm (C) and 115 ppm (A), fuel NOx 125 ppm (C) and 35 ppm (A), thermal NOx after EGI 54 ppm (C) and 52 ppm (A), total NOx after EGI 179 ppm (C) and 87 ppm (A), and total NOx after TSC 87 ppm (C) and 40 ppm (A) (reduction rate 64.5% and 73.4%). The particulate concentration is increased by TSC, while it is decreased by EGI.

52171 **APTIC NO. 74581**

Matsumura, Yuji

COUNTERMEASUREMENTS FOR LOW NOX AND ENERGY CONSERVATION, PART 2. *(NOx teigen to sho enerugi taisaku, 2). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(1):73, Jan. 1975.*

Off-stoichiometric combustion and two-stage combustion for nitrogen oxides reduction were reviewed. A batch type forging furnace using two HT burners (short and long flame burner) was tested for off-stoichiometric combustion by setting the air-fuel ratio at 1:3. The total NOx was reduced for 50%. At 800 deg furnace temperature, insufficient heating and the formations of carbon monoxide and soot, which are common in off-stoichiometric combustion, were not observed. A continuous heating furnace consuming 1800 cu m/hr gas with 3 heating zones on the upper furnace and 2 heating zones on the lower furnace emitted gases containing 70-80 ppm NOx at 3% excess oxygen. Energy conservation by utilization of the residue temperature of the furnace and recovery of waste heat were also described.

52172 **APTIC NO. 74661**

Matsuo, M.

PRESENT STATE OF LOW NOX BURNERS AND THEIR ACTUAL EXAMPLES. *(Genjo ni okeru tei NOx bana to sono jitsurei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(5):57-63, May 1975.*

Two low nitrogen oxides burners, an NFK-TRW burner and a NKF-SRG burner, were tested for various furnaces and boilers. The NKF-TRW burner utilized rapid mixing of air and fuel and effective heat transfer to the heating surface to minimize the time for which the combustion gases remained at high temperature. In a testing furnace with a maximum combustion capacity of 380 l/hr, NOx concentration was reduced from 75-90 ppm for a conventional burner to 40-60 ppm, or a 40% reduction, with A heavy oil containing 0.29% nitrogen as fuel. The particulates concentration was reduced from 0.035-0.04 g/N cu m to 0.015- 0.03 g/N cu m. Application of the NFK-TRW burner to boilers with capacities ranging from 4 tons/hr to 16 tons/hr resulted in up to 50% NOx reduction, with A-oil as fuel. The NFK-SRG burner utilized the suction effect caused by air injection to recirculate part of the high temperature combustion gas into fuel injection chamber. For a testing furnace at 30% excess air, the NOx concentration was reduced from 158 ppm to 117 ppm for a 35% reduction with B-oil as fuel (N content 0.18%).

52173 **APTIC NO. 74967**

Meyer zu Riemsloh, H. and U. Krause

DESCRIPTION AND EVALUATION OF BAG FILTER SYSTEMS CLEANED MECHANICALLY OR BY MEANS OF COMPRESSED AIR. *(Beschreibung und Beurteilung mechanisch und mittels Druckluft abgereinigter Schlauchfiltersysteme). Text in German. Aufbereitungs-Technik, 16(5):245-254, 1975. 4 refs.*

A summary of the theory of separating dust particles from textile filters is given. The cleaning of these filters in three phases is presented. The phases include: interruption of the raw gas flow, mechanical separation of the dust and dust cake from the surface of the filter, and the rinsing of the filter in the direction opposite from the flow of filtration. A comparison is made of various construction types, and the elements involved in cleaning by compressed air are described. A compressed-air system is also presented.

52174 **APTIC NO. 74337**

Minemura, Katsuya

DESIGNING AND PRACTICING IN FLUE GAS DESULFURIZATION EQUIPMENT. *(Haien datsuryu sochi no sekkei to jissai). Text in Japanese. Kenchiku Setsubi (Architectural Equipment), 26(2-3):17-20, Feb. 1975.*

Wet-type flue gas desulfurization processes which use an alkaline solution for sulfur dioxide absorption and conversion to sodium bisulfite are discussed. Important features of wet processes are large contact area of the absorbent particles, a low flue gas temperature, and frequent contact between the absorbent and SO2. The total area of the absorbent particles is increased by using nozzles to inject the absorbent into the gas flow at high pressure. Water containing 1-2% alkali is sprayed into the gas to reduce the gas temperature before desulfurization. A mist separator is necessary for the removal of mists containing sodium bisulfite and unreacted alkali to achieve better desulfurization efficiency. For white smoke prevention, high temperature gas from an afterburner is mixed with the flue gas, and the resulting gases are released from the stack at 125-135 C. The alkaline absorbent most often used for desulfurization is sodium hydroxide. The waste liquid which contains sodium bisulfite is treated with oxidizing agents such as potassium permanganate or air.

52175 **APTIC NO. 74772**

Mitsuyama, Masaru and Asao Tadokoro

AN INTAKE DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Nainen kikan no kyuki sochi). Text in Japanese. (Toyo Kogyo Co. (Japan)) Japan. Model Util. Sho 50-4892. 3p., Feb. 10, 1975. (Appl. March 16, 1971, 1 claim).*

An intake device to prevent afterburning in internal combustion engines is described. A normally opened shutter valve is installed behind the throttle valve of the intake tube and a condenser is installed in the circuit of the ignition switch and relay. The condenser is charged when the ignition switch is closed. The shutter valve is closed for a short time by the magnetic force which is induced by the discharged electric current from the condenser when the ignition switch is opened. Since the shutter valve is closed only for a short time when the ignition switch is turned off, a complicated mechanism to open the valve is not necessary. This device prevents an afterburning and incomplete combustion, which is useful for internal combustion engines with exhaust recombustion systems.

52176 **APTIC NO. 76645**

Miyabe, H. and T. Ito

STUDIES OF AIR-FUEL FLUCTUATION IN GASOLINE ENGINE. *(Gasorin kikan no kunenpi hendo). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 1-4, 1975. (Presented at the Japan Society of Mechanical Engineers, Lecture Meeting, Tokyo, Japan, April 1-3, 1975.)*

The effects of air/fuel variation for a 4-cycle single cylinder engine at constant operation was examined using a newly developed air/fuel meter. Engine exhaust sampled at exhaust port was oxidized with copper oxide and the carbon dioxide concentration in the resulting gas was analyzed by TCD. The operation conditions were 1500/3000 rpm with 1/4 to 4/4 throttle valve opening and 12, 14 and 16 air/fuel ratios. At air/fuel of 16, the air/fuel variation at 4/4 and 2/4 throttle valve opening was found to be 3% and 11%, respectively. At throttle valve opening of 2/4 and 100 mm air inlet tube length, the air/fuel variation cycle was 11 seconds compared to 17 seconds for zero air inlet tube length. The variation was also greater at idling.

52177 **APTIC NO. 74488**

Miyamoto, N., T. Murayama, and S. Fukazawa

STUDY ON LOW COMPRESSION RATIO DIESEL ENGINE. *(Tei asshukuhi diizeru kikan ni kansuru kenkyu). Text in Japanese. Nippon Kikai Gakkai Ronbunshu (Trans. Japan Soc. Mech. Engrs.), 41(344):1254-1262, April 1975. 7 refs.*

Experiments with a low compression ratio diesel engine to control the rate of initial combustion and investigate the relationship between air intake temperature and rate of initial combustion were performed. Changes in engine performance, due to a rise in air intake temperature rise, and factors affecting nitrogen oxide emission were also examined. Based upon the evaporation theory of a single drop and heat reaction theory, the theoretical combustion rate was derived and was approximately the same as that obtained experimentally (maximum initial combustion rate), thus making it possible to control the initial maximum combustion rate by air intake temperature change. The relationship between engine starting performance and air intake temperature was also examined. The engine used for the experiment was a four-cycle direct jetting diesel engine. When the intake temperature increased, the maximum power and minimum fuel cost ratio deteriorated.

52178 **APTIC NO. 74565**

Morishita, S., Y. Oze, Y. Sasaki, H. Asano, S. Kitao, I. Okuma, K. Mori, and Y. Seki

STUDIES ON THE COUNTERMEASURES AND MEASUREMENT OF BAD ODORS (III). DEODORATION APPARATUS OF EXHAUSTS AFTER DRYING OF FECES OF HENS. *(Akushu no hyoka to taisaku ni kansuru kenkyu (Dai 3 po). Keifun kanso haiki no sasshu sochi). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(19):38-43, March 1975. 4 refs.*

A method for deodorizing exhaust gases from dryers used for treating hen feces is described. The odorous gas discharged from the drier is led into a tower where the gas is washed and cooled with water. Water soluble gases are removed in this tower to some extent. The washing water must be ample enough; otherwise, the temperature of the washing water rises, resulting in the evaporation of odorous gases from this water. The washings are kept in a tank. The gas is then sent to a reaction tower. Sodium hypochlorite solution is showered from the top of the tower. This solution returns to a sodium hypochlorite solution tank and mixes with tablets of calcium hypochlorite. The gas, deodorized by sodium hypochlorite, is discharged from the top of the reaction tower. The decrease in the concentration of the sodium hypochlorite solution is compensated for by the treatment with calcium hypochlorite tablets. The washings in the tank are mixed with waste sodium hypochlorite solution for deodorization. When 7.1 of washing water is used for 1 cu m of the odorous gas, the elimination of ammonia and hydrogen sulfide is satisfactory. When the ratio is 3 l/cu m gas, some odor remained after the washing. However, the odor is completely removed by the sodium hypochlorite treatment.

52179 **APTIC NO. 74503**

Morita, T.

DESULFURIZATION OF FLUE GAS USING A SODIUM SULFITE-BASED METHOD: ON SODIUM SULFITE AND SODIUM SULFITE-GYPSUM METHOD. *(Aryuso o besu ni shita haien datsuryu: Aryuso ho, aryuso-sekkoho no tsuite). Text in Japanese. Soda to Enso (Soda Chlorine), 26(3):9-15, March 1975. 6 refs.*

Flue gas desulfurization by the sodium sulfite method and the sodium sulfite-gypsum method developed jointly by Kureha Chem. Co. and Kawasaki Heavy Ind. Co. is described. In the Na2SO3 method, the sulfur dioxide is absorbed in Na2SO3 solution producing sodium bisulfite, which is recovered as Na2SO3 crystals by adding sodium hydroxide. In the Na2SO3-gypsum method, the absorption process is the same; however, the NaHSO4 obtained is reacted with calcium carbonate producing calcium sulfite, which is subsequently either reacted with sulfuric acid giving NaHSO3 and calcium sulfate or oxidized directly to CaSO4. The desulfurization rate is in the range of 95.8-98.4%. The development process, operational procedure, operational conditions and characteristics of these methods are described with test data, operation records, and flow sheets.

52180 **APTIC NO. 76745**

Munakata, Yoshinori

ELIMINATION OF ODOROUS GASES BY OXIDATION WITH OZONE. *(Ozone sanka ho ni yoru akushu gas jokyo). Text in Japanese. Kemikaru Enjinyaringu (Chem. Eng.), 20(5):399-402, May 1975. 1 ref.*

Oxidation by ozone is quite effective for the deodorization of methyl mercaptan, methyl sulfide, dimethyl sulfide, and hydrogen sulfide. It is also effective for the treatment of a large amount of gas containing very dilute odorous substances. For example, the treatment is quite suited for the destruction of odors from sewage disposal plants. A typical practice is to transport odorous gas with a blower, wash the gas with water to remove soluble odorants, and then react the gas with O3. Finally, the gas mixture is treated with a layer of active carbon to remove residual odorous gases and to decompose residual O3. Then the odorless gas is discharged. The amount of O3 required to decompose odorous substances is as follows: for the odor from sewage, 1.0-1.5 ppm; for fish odor, 1.5-2.0 ppm; and for odor from feces and urine, 2.0-3.0 ppm. Deodorization is performed with a relatively small amount of O3. For example, 200-1000 ppm hydrogen sulfide can be deodorized with 1-1.5 ppm O3. The energy required for the production of 1 kg O3 is 35 kW.

52181 **APTIC NO. 74917**

Murakami, K.

DESULFURIZATION OF STACK SMOKE IN JAPAN. *(Wagakuni no haien datsuryu ni tsuite). Text in Japanese. Sekkai (Lime), 233:20-43, May 1975.*

The status of stack gas desulfurization in Japan is discussed. Only in Japan, is gypsum from desulfurization of stack smoke being utilized. The oil desulfurization capacity is 100,000 kl a day. Desulfurization of stack smoke may reach 20 million kl in 1975. In 1973 gypsum production reached 5 million tons (natural gypsum, 300,000 tons). Consumption of gypsum, for cement, gypsum board, and plaster reached 5 million tons also. Methods currently used for stack gas desulfurization in Japan are discussed and flow diagrams for each type are given. Japan practices desulfurization of stack smoke more than other industrialized countries because of the need to eliminate pollution and the lack of natural gypsum. There is a gypsum surplus of about 100,000 tons a mo, but it does not constitute any danger. In 1978, gypsum from desulfurization of stack smoke will reach 2,400,000 tons (1,500,000 tons in terms of lime).

52182 **APTIC NO. 74979**

Nagai, Tadashi

RECYCLING EXHAUST GAS CONTROL METHOD OF THE RECYCLE ENGINE. *(Risaikuru kikan sochi ni okeru risaikuru haiki gasu seigyo hoho). Text in Japanese. (Hitachi Shipbuilding and Engineering Co., Ltd. (Japan)) Japan. Pat. Sho 50-9928. 3p., April 17, 1975. 2 refs. (Appl. April 14, 1972, 1 claim).*

This invention relates to a control method for recycling exhaust gas. A compressor capable of compressing more gas than the excess exhaust gas at the maximum engine load is equipped in the recycling path. Gas in an amount slightly greater than the excess exhaust gas at maximum load is constantly introduced from a gas-liquid separator. Part of the gas is passed through a secondary-pressure regulator and is returned to the gas-liquid separator, in which the pressure is maintained at absolute pressure. The rest of the gas is released from the engine system. Oxygen from an oxygen cylinder is mixed with the recycling exhaust gas in a mixer and the mixture is heated by the released hot exhaust gas. The preheated mixture is then mixed with the fuel in the engine main body where the combustion is carried out.

52183 **APTIC NO. 74774**

Nakai, Takao

DUST COLLECTOR FOR SKYLIGHT OF FACTORY. *(Kojo tenmado-yo shujin sochi). Text in Japanese. (Nissan Precision Machinery Co. Ltd., Tokyo (Japan)) Japan. Pat. Sho. 50-6673. 2p., March 17, 1975. (Appl. Feb. 10, 1971, 1 claim).*

A dust collector using water foam as an adsorbent was developed. This device can be installed beneath the skylight window of factories and consists of a sloped screen ceiling, a blower, a water foam generator at the top of the screen ceiling, and a foam annihilator at the bottom of the screen ceiling. The principle of this device is that dust and water soluble gases which are ventilated through running water foams can be adsorbed by the surface of water foams. The advantages of this device are excellent efficiency of dust collection from the dusty air of factories and low initial cost for installation.

52184 **APTIC NO. 76652**

Nakajima, K.

THE CORRELATION OF COMBUSTION AND AIR SWIRL IN DIRECT INJECTION DIESEL ENGINE. *(Chokusetsu funsha shiki diesel engine ni okeru nensho to swirl ni tsuite). Text in Japanese. Nissan Diesel Giho (Nissan Diesel Tech. Rev.), no. 37:92-99, 1975.*

The effects of the combustion control by air swirl on engine output, fuel cost, and exhaust gases were investigated by using two direct-injection, single-cylinder engines. The results were as follows: when matching with a high-swirl type suction duct, the output and smoke condition were improved but the nitric oxide concentration increased; when compared at the matching points, correlations were found between swirl ratio and the amount of injection during the firing delay; an increase of the diameter of the combustion chamber reduced the NO concentration but worsened the smoke condition; an increase of the plunger diameter of the injection pump improved the smoke condition but increased the NO concentration and worsened the noise condition; and the pressure increasing rate immediately after firing was proportional to the number of nozzles and the amount of injection during the firing delay.

52185 **APTIC NO. 74969**

Nakayama, M.

COMBUSTION CHARACTERISTICS OF METHANOL AND TOPICS OF MIXED FIRING. *(Metanoru no nensho tokusei to konsho no mondaiten). Text in Japanese. Netsu kanri to Kogai (Heat Management Public Nuisance), 27(8):23-28, Aug. 1975. 5 refs.*

Methanol as fuel was evaluated in terms of combustion characteristics and in comparison with other fuels. The calorific value of CH3OH is about 1/2 of that of c-heavy oil. The flame temperature distribution and maximum flame temperature of CH3OH (1200 C) are compared with those of c-heavy oil (1300 C). Data on formation rates of toxic substances such as nitrogen oxides, carbon monoxide, hydrocarbons, aldehydes, and smoke in the case of methanol combustion were compiled and analyzed in comparison with those of other fuels. The flame color, flame radiation rate calculated from measured flame temperature, and heat radiated on furnace wall and theoretical flame radiation rate were analyzed. The need for the development of a methanol atomizer is discussed. As for the mixed firing, such effects of mixing fuels as sludge formation, increase in viscosity, and separation of fuels are discussed in general terms.

52186 **APTIC NO. 74839**

Nihei, Hisao

FUEL CONVERSION FOR NOX CONTROL MEASURE. *(NOx yokusei taisaku no tame no nenryo tenkan). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(5):10-15, 1975. 4 refs.*

Fuel conversion for stationary source nitrogen oxide emission control is discussed. Combustion techniques for thermal NOx control are not sufficient to meet increasingly stringent standards in Japan. The combustion of gas fuel produces less NOx than that of liquid or solid fuel. Fuel conversion requires minimum modifications to present combustion facilities, without increasing the cost of fuel combustion. A switch from type B or C heavy oils to kerosene or type A heavy oil for large industrial boilers is expected to reduce NOx emissions by 38%.

52187 **APTIC NO. 76707**

Oder, R. R.

PYRITIC SULFUR REMOVAL FROM COALS BY HIGH GRADIENT MAGNETIC SEPARATION. *Preprint, Bechtel Corp., San Francisco, Calif., 20p., 1975. 22 refs. (Presented at the Complete Watereuse: Water s Interface with Energy, Air and Solids, National Conference, 2nd, Chicago, Ill., May 4-8, 1975.)*

A physical method for removing pyritic sulfur from coal, known as the High Gradient Magnetic Separation method, is described. High gradient magnetic separators operate like filters wherein the entraining forces are magnetic. The filter bed is composed of a very fine-sized stranded filamentary magnetic material. The magnetic filter material serves both as a collection surface for the retention of magnetic particles and as a source for the intense magnetic forces which are generated. The steel wool strands become magnetized by a background magnetic field supplied by an auxilliary electromagnet. The method is particularly suited for the removal of sulfur from coal since 50% of the coal sulfur content occurs in the form of the mineral pyrite. Results obtained for a single pass of the magnetic field show a reduction in coal sulfur content of from 4.4% (prior to treatment) to 2.0%. The capital cost of a 10,000 ton/day HGMS unit for removing 80% of the pyrite from coal is estimated at 0.4-1.0 dollars/ton of coal produced.

52188 **APTIC NO. 74896**

Oka, Hideo

DRY METHOD OF NOX REMOVAL BY THE SUMITOMO CHEMICAL PROCESS. *(Sumitomo Kagakushiki dassho purosesu ni tsuite). Text in Japanese. Preprint, Japan Management Assoc., Tokyo, p. 15-30, 1975. (Presented at the Japan Management Association Symposium on Pollution Engineering, Tokyo, Japan, March 17, 1975.)*

The Sumitomo Chemical Process for removing nitrogen oxides from flue gas is reviewed. Nitrogen oxides are treated with ammonia to give nitrogen and water. Catalysts play an important role in this reaction. An excellent catalyst, named C, was developed. This catalyst showed an NOx removal rate of 80-95% in the temperature range between 250 and 400 C. In the practice of NOx removal by treatment with NH3, possible NH3 leaks may cause air pollution. To avoid this pollution, a catalyst, named A, was developed. Catalyst A has not only the ability to decompose NH3 but also the ability to remove NOx. By the use of these catalysts it was possible to treat 200,000 normal cu m of flue gas per hr at about 300 C. The ratio NH3/NO was about 1.0. The NOx and oxygen concentrations were about 200 ppm and 7%, respectively. The NOx and NH3 concentrations at the exit were less than 20 ppm and 10 ppm, respectively.

52189 **APTIC NO. 74970**

Okamoto, Kyuji

AN IGNITION TIME CONTROLLER. *(Tenka jiki seigyo sochi). Text in Japanese. (Nippon Denso Co., Ltd. (Japan)) Japan. Pat. Sho 50-12057. 7p., May 8, 1975. (Appl. June 6, 1970, 1 claim).*

In the ignition time controller for internal combustion engine designed, the ignition time required for a particular engine condition is selected from a group of preset ignition times determined based on factors such as engine speed and intake negative pressure. The device described here consists of an engine speed detector which closes the circuit in the set range of engine speed, an intake negative pressure detector which closes the circuit in the set range of intake negative prressure, contact breakers, ignition signal generating elements which generate the ignition signal independently, and ignition circuits. The above mentioned detectors are connected in series to the primary circuit of the ignition circuit in geometric progression, and contact breakers are connected to a number of detectors in the final stage. The above mentioned contact breakers are connected to corresponding igntion signal generating elements satisfying conditions of all detectors.

52190 **APTIC NO. 74977**

Okura, Takao, Sakuji Arai, and Toshihiko Sato

A JET FFUEL COMPENSATING DEVICE FOR A NEGATIVE PRESSURE CONTROL TYP FUEL INJECTOR. *(Fuatsu seigyo shiki nenryo funsha sochi no funsha nenryo hosei sochi). Text in Japanese. (Honda Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-14687. 3p., May 29, 1975. 1 ref. (Appl Dec. 31, 1970, 1 claim).*

This invention relates to a jet fuel compensating apparatus corresponding to the opening of the throttle valve. A gas inlet tube is connected to the negative pressure chamber through a branching tube. A releasing valve is equipped on the branching tube. The valve body which operates the releasing valve is operated by a rotating axis connected to the throttle valve and by a cam. A governor spring is equipped in the negative pressure chamber to counteract the negative pressure and to push a diaphragm which separates the chamber. When the throttle valve is opened by counterclockwise rotation, the valve body of the cam is lowered, which opens the releasing valve and the negative pressure in the chamber is reduced. The controlled cam of the fuel pump is then opened corresponding to the opening of the throttle valve.

52191 **APTIC NO. 76665**

Ono, J., H. Sawada, H. Okamura, and T. Ito

POLLUTION FREE FLARE SYSTEM DEVELOPMENT. *(Mukogai furea shisutemu no kaihatsu jittai). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(6):89-93, June 1975.*

A pollution-free flare system that uses a 60 ton/hr ground flare and an optional elevated flare stack is described. The ground flare may be installed singly or together with an elevated flare stack. Waste gas emitted by plant is detected by a flowmeter at the plant, and before the waste gas enter the ground flare, steam precedes it to secures minimum draft and abatement of black smoke during the initial flare. When waste gas output increases, pressure gauges indicate the necessity for diverting waste gas flow to the next stage. When the waste gas increases over the capacity of the ground flare, the waste seal on the tank for the elevated flare stack is automatically broken so that the gas is burnt in the elevated flare stack. The ground flare is an open top incinerator equipped with a special combustion facility. A fire-proof, heat-insulating lining on the inner wall protects the outside from the high temperature flame. The combustion facilities consists of nozzles for waste gas, smoke abatement, and for decreasing the gas temperature, radiant heat, and nitrogen oxide emissions as well as a pilot burner. An outer cylindrical wall protects the furnace from wind.

52192 **APTIC NO. 74658**

Ono, Yoshio and Kenzo Morishita

REDUCTION METHOD OF EXHAUST GAS QUANTITY. *(Haiki gasu gensho hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-3752. 2p., Feb. 8, 1975. (Appl. Sept. 22, 1972, 1 claim).*

A cleaning method for automobile exhaust through contact with sintered oxide semiconductors consisting of tin, antimony, manganese, and palladium oxides is discussed. This device has a much higher efficiency and lasts longer than any similar device deloped previously consisting of oxides of iron, manganese cobalt, nickel, aluminum, and other rare earth metals. This sintered oxide semiconductor device is composed of: tin oxide: 30 wt ratio, tin hydrogen oxide: 30 wt ratio, antimony oxide: 2 wt ratio, manganese chloride: 2 wt ratio, palladium chloride: 1 wt ratio, carbon powder: 4 wt ratio, and ammonium carbonate: 10 wt ratio, for example. This device converts 100% of carbon monoxide into carbon dioxide at 350 C. This compound provides oxygen to CO at higher temperatures and absorbs oxygen from air at normal temperatures. There is no effect on efficiency.

52193 **APTIC NO. 74985**

Oshika, Sumio, Tetsu Nakagawa, Hiroshi Yoshizaki, and Ryo Sato

HC EMISSION OF DIESEL ENGINES AND COUNTERMEASURES AGAINST THE EMISSION. *(Diesel engine no HC emission no hassei to sono taisaku). Text in*

Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 5-13, 1975. 4 refs. (Presented at the Japan Society of Automotive Engineers, Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)

The origin of hydrocarbons discharged from diesel engines with an eddy current chamber is discussed. The origin of HC at low load and at low and medium speed is secondary injection. By the elimination of this injection, the emission of HC can be kept at a low level. For the elimination of the injection, the use of reflection wave decay valves is recommended. The delay of the time of injection significantly increases the HC discharge. Therefore, due consideration must be paid if the delay is applied to reduce the nitrogen oxide content. When the nozzle is directed toward the center of the eddy current, the HC content decreases, but knocking and NOx content increase. Oil returning from the exhaust valve system largely affects the HC content. Therefore, the valve seal must be complete. When the above points are satisfied, it is possible to reduce the HC value to 1 g/mi for LA4 mode.

52194 **APTIC NO. 74292**

Oshima, Mamoru and Shoichi Takasaki

OPERATIONAL RESULTS OF WET METHOD DENITRIFICATION AND DESULFURIZATION PROCESS FOR 62,000 N CU M/HR FLUE GAS OF FUJIKASUI INDUSTRIAL CO. *(Shishiki 62,000 N cu m/hr kado deita, Fujikasui Kogyo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(2):37-42, Feb. 1975.*

The world s first simultaneous desulfurization and denitrification plant was installed at the Sumitomo Metal Industrial Co. The plant consists of three towers; cooling, oxidation, and absorption. Dusts in flue gas are first removed at the cooling tower, and nitric oxide is oxidized to nitrogen dioxide by chlorine dioxide gas in the oxidation tower. The flue gas then enters the absorption tower where sulfur dioxide is absorbed by sodium hydroxide solution and the generated sodium sulfite reacts with NO2 forming nitrogen gas and sodium sulfate. The oxidation of NO by chlorine dioxide occurs stoichiometrically, and 0.5 mole of chloride dioxide oxidizes completely one mole of NO. The maximum flue gas treatable by this plant is 62,000 N cu m/hr. The efficiencies of denitrification and desulfurization are better than 95% and 99.5% respectively. The desulfurization efficiency does not change with the sulfur content in flue gas, therefore heavy oils with various sulfur contents can be combusted with low sulfur dioxide emissions.

52195 **APTIC NO. 74324**

Peterzan, P. and M. Wakabayashi

SCOT PROCESS. *(SCOT purosesu). Text in Japanese. Sekiyu Gakkai-shi (Bull. Japan Petroleum Inst.), 18(4):327-329, April 1975. 2 refs.*

The Shell Claus Off Gas Treating (SCOT) process which removes sulfur compounds from the tail gas of sulfur recovery units used in oil refineries is described. The process utilizes a line heater for the mixing of tail gas and is mixed with a reducing gas such as hydrogen before entering into the reaction furnace. The sulfur compounds are reduced to hydrogen sulfide in the reaction furnace with the aid of a cobalt-molybdenum catalyst on alumina. The H2S is absorbed in an apparatus containing diisopropanolamine solution. The sulfur content of the treated gas is less than 300 ppm. The treated gas is then sent to an incinerator for conversion of the H2S to sulfur dioxide. The use of two Claus units in the SCOT process allows for a 96 to 98% sulfur recovery. The recovery efficiency is not affected by the amount of air supply to the Claus process within an excess air rate + or - 10% of the theoretical air supply amount. A total desulfurization efficiency of more than 99.8% can be achieved by combining a flue gas desulfurization unit with the SCOT process.

52196 **APTIC NO. 74766**

Quillevere, Alain, Raymond Briancon, and Jean Decouflet

DESIGN OF LOW CONTAMINATION RATE BURNING UNITS. *(Conception des foyers a faible taux de pollution). Text in French. Aeronaut. Astronaut., no. 50:40-56, Jan. 1975.*

Current combustion technology and the generation and evolution processes of air pollutants in burner sections of aircraft engines with and without reheat are discussed along with the air pollution produced by such engines. A mathematical model of the external combustion process is presented, and methods for reducing pollutant emissions are outlined. The principal pollutants emitted are carbon monoxide and hydrocarbons during landing and particulates and nitrogen oxides during take-off and cruising. Considerable reduction of CO and unburned hydrocarbon emissions at idle are achieved by the systematic use of annular chambers and for visible smoke by an improved injection technqiue ensuring partial premixing. Turboreactors of low capacity and low compression generate intrinsically large amounts of unburned hydrocarbons at idle, while powerful engines with high compression emit predominantly oxides of nitrogen. Advanced techniques, such as staged injection and variable geometry, achieve an overall reduction in pollutant emissions, but the technological problems associated with these solutions require additional studies. Partial reheat reduces the CO and hydrocarbon emissions during landing and take-off, but its possibilities are limited. Water injection reduces nitrogen oxide emissions considerably, but it is not applicable at cruising and reduces the life of vital engine components.

52197 **APTIC NO. 74483**

Rasch, Rudolf

POLLUTANT ELIMINATION FROM FLUE GASES OF INCINERATORS. *(Schadstoffeliminierung aus Rauchgasen von Muellverbrennungsanlagen). Text in German. Muell Abfall, 7(4):91-96, 1975. 26 refs.*

Waste gas cleaning methods applied to incinerators focus on the removal of hydrogen chloride and fluoride. The hydrogen chloride concentration in the cleaned gas may not exceed 100 mg/cu m air. The maximum air concentration according to new regulations may over long periods of time not exceed 0.1 mg/cu m air. Dry binding of hydrogen chloride to alkaline fly ash or to suitable additives such as ground quicklime, calcium hydrate or limestone, or dolomite and magnesite presently receives great attention but requires further development. If a scrubbing process is selected for elimination of the hydrogen chloride, the flue gases are first cleaned of dust to reduce the sludge quantity at the end of the cleaning process. The benefit of scrubbing is hotly debated primarily because of the waste water problem it creates. A recent process using an endless cloth filter which moves over rollers like a vertically arranged conveyor belt achieved a good retentio efficiency for hydrogen chloride.

52198 **APTIC NO. 74479**

Rueb, Friedmund

VERSATILE POSSIBILITIES OF TREATMENT OF WATER AND AIR WITH OZONE. *(Vielseitige Moeglichkeiten der Behandlung von Wasser und Luft mit Ozon). Text in German. Wasser Luft Betrieb, 19(4):147-151, 1975.*

The generation of ozone and its use for water and air treatment are discussed. Ozone can be used for air treatment whenever odors have to be removed. A method of wet oxidation of odorous waste air from sewage purification plants is illustrated. The waste air goes to a scrubber, where during a residence time of 5 sec, ozone containing water is sprayed into the waste air. The two phases are afterwards separated in a droplet separator, and the scrubbing water is recirculated after regeneration. The method has the advantages of deodorizing waste air efficiently and economically. A second method is described in which ozone is not used for deodorization but rather for regeneration of an oxidizer dissolved in water (e.g., potassium permanganate).

52199 **APTIC NO. 74761**

Rueden, Henning, Edgar Thofern and Maria Schmitz

WATER-SOLUBLE SUBSTANCES AND MICROORGANISMS IN FINE DUST FILTERS OF AIR CONDITIONING SYSTEMS. *(Wasserloesliche Inhaltsstoffe und Mikroorganismen in Feinstaubfiltern von Klimaanlagen). Text in German. Staub, Reinhaltung Luft, 35(6):215-219, 1975. 5 refs.*

After a lengthy usage period, filters both with mechanisms for preliminary moistening by water or steam and without such mechanisms were removed from air-conditioning systems. In aqueous extracts taken from the filters, various chemical substances were found and identified. In some filters, irrespective of where they had been in use, there was an increase in the concentrations of sodium, potassium, ammonium, sulfate and nitrate ions. There was also a continuous increase in the conductance of the filters and in their sulfate and ammonium content. The pH value decreased significantly after one week, and remained at a low level. This is a likely cause of the destruction of microorganisms. The major substances separated from the air were ammonium compounds, sulfates, and nitrates.

52200 **APTIC NO. 74379**

Saeki, Isamu

NOX AUTO EXHAUST GAS STANDARD, 0.25 G/KM IN 1976; KUMAGAI ENGINE OF MITSUBISHI AND OTHER NEW DEVELOPMENTS. *(51 nendo ni NOx, 0.25 g/km wa kano; Mitsubishi Jidosha no kaihatsu suru Kumagaya enjin no wadai o chushin ni). Text in Japanese. Jidosha to Seibi (Automob. Main.), 29(3):52-58, March 1975.*

The efforts of Japanese automobile makers to meet the new automobile exhaust standard are summarized. The tentative standard for nitrogen oxides from 1976 through 1978 is discussed. Mitsubishi, Yamaha, Fuji Heavy Industry, Honda, and Mazda are in the process of new development or modification of low pollution engines. Mitsubishi almost succeeded in achieving the 0.3 g/km values for NOx by using the Kumagai rich and lean combustion system and a thermal reactor. Yamaha also developed a new lean combustion engine (Yamaha Lean Combustion System). This method has achieved 0.4 g/km NOx emissions. Fuji announced successful modification of their engine and are ready for any tentative standard. Honda(CVCC) and Mazda (Rotary) can possibly achieve 0.4 g/km emissions.

52201 **APTIC NO. 74797**

Sakamoto, Kazuo

A DUST COLLECTOR ELECTRODE FOR AN ELECTRIC PRECIPITATOR. *(Denki shujin sochi no shujin denkyoku). Text in Japanese. (Tsutsunaka Plastic Kogyo K. K. (Japan)) Japan. Model Util. Sho 50-17112. 3p., May 27, 1975. (Appl. Feb. 26, 1971, 1 claim).*

A dust collector electrode arrangement for electric precipitators is described that prevents electric discharge at the pointed end of the electrode. The arrangement consists of a rounded end electrode whose end is covered with insolating material and a discharge electrode covered at the position corresponding to the end of the dust collector electrode. The dust collector electrode was modified to remedy shortcomings of existing electrodes. The surface of electrode plate which is made of insolating plastic material is coated with an electroconductive layer except at the lower end where it is coated with an insolating layer to the same surface level as that of the electroconductive layer. An insolating electrode substrate materials, common electrode materials such as hard polyvinyl chloride reinforced with glass fiber are used. As an electroconductive layer, a thin film of hard polyvinyl chloride mixed with electroconductive carbon powder, metal powder, or a film of non-woven fibrous carbon is used. The insolating electrode material for the lower end is used either with or without hydrophilic surface treatment.

52202 **APTIC NO. 74941**

Sakuma, Junichi and Shinji Nishizaki

A CATALYTIC HYDROGENATION AND DESULFURIZATION METHOD FOR CRUDE OILS. *(Jushitsu yu no seshoku suisoka datsuryu hoho). Text in Japanese. (Ishikawajima-Harima Heavy Industries Co., Ltd. (Japan)) Japan. Pat. Sho 50-12444. 3p., May 12, 1975. (Appl. April 14, 1969, 1 claim).*

A process for the catalytic hydrogenation-desulfurization of crude oil by a liquid-phase reactor and a gas-phase reactor is described. Crude oil is pre-heated and mixed with hydrogen gas. The mixture is heated and introduced into a high temperature-high pressure separator where the liquid and gas phases are separated. The liquid was put into a liquid-phase reactor containing heated hydrogen gas. The desulfurized oil is collected as a product. The gas from the high temperature-high pressure separator is introduced into a gas-phase reactor and the resulting gases were mixed with the gas from the liquid-phase reactor. The combined gases are condensed. The condensed oil is collected after dissolved gas is removed by a constant temperature-constant pressure separator. Gas from the condenser is washed in a purification tower and the unreacted hydrogen is recirculated. Experimental results showed 81% desulfurization for a crude oil containing 4.16 wt% sulfur.

52203 **APTIC NO. 74811**

Sato, Seigoro

SMOKE AND SOOT PURIFYING EQUIPMENT. *(Baien joka shori sochi). Text in Japanese. (Tokyo Project K. K. (Japan)) Japan. Pat. Sho 50-10544. 2p., April 22, 1975. 1 ref. (Appl. Sept. 9, 1970, 1 claim).*

A device for the purification of smoke by a series of filters. Gas is introduced into a washing-filtering cylinder in which there are pipes with water-spraying nozzles. After washing the gas passes to a second cylinder where it is sprayed with a liquid containing activated carbon. The resulting gas is then passed through a cylinder containing two lime-cotton filters with two activated carbon-cotton filters in between. Dusts in the smoke are removed by washing and filtering while desulfurization is achieved in the second cylinder. Other particles are removed by the cotton filters.

52204 **APTIC NO. 74962**

Sawamura, H.

REMOVAL OF NOX IN BOILER EXHAUST GAS BY THE SELECTIVE CATALYTIC REDUCTION PROCESS. *(Sentakuteki shokubai kangenho ni yoru boira haigasu no NOx no jokyo). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(2):114-120, Feb. 1975.*

Catalytic reduction, including the wet and dry processes which are sub-classified into the non-selective catalytic reduction process, the selective catalytic reduction process, and the catalytical composition process, is discussed. The dry process was superior to the wet process for the simplicity of procedure and reaction. The selective catalytic reduction process by ammonia, the development of Mitsui Toatsu equipment, the MTC-102 catalyst, and the MTC-104 (SO2-resistant catalyst) are reviewed. In these processes the selective catalytic reduction process was superior to the others. The selective reduction process of nitrogen oxides by NH3 only in the presence of excess oxygen had the following advantages: NH3 was not used for the reduction compounds other than NOx, a large reduction velocity and nearly total removal of NOx, and no secondary pollution.

52205 **APTIC NO. 74358**

Schmitz, Paul

EMISSION OF OXIDES OF NITROGEN DURING THE NITRATION OF ORGANIC COMPOUNDS. *(Emission von Stickstoffoxiden bei der Nitrierung organischer Verbindungen). Text in German. Staub, Reinhaltung Luft, 35(4):136-138, April 1975. 10 refs.*

The nitration of organic compounds in the Federal Republic of Germany leads to an annual nitrogen oxide emission from 470 to 950 tons which is less than 0.1% of the total NOx emissions in the country. A review of the nitration process is given. The following processes for the reduction of NOx emissions from such plants are briefly reviewed: oxidation with sodium chlorite or chlorine dioxide, treatment of the waste gas with aqueous alkali and surface active substances, and oxidation and absorption with chlorine bleach. All these processes require relatively long reaction times and yield non-usable products. The removal of NOx under reducing conditions, in contrast, yields useful sulfates and bisulfates. Equally suitable methods are catalytic and thermal afterburning.

52206 **APTIC NO. 74971**

Shimada, Noriyoshi and Noboru Tomihisa

A PRODUCTION METHOD FOR AN ADSORPTIVE DESULFURIZER. *(Kyuchaku datsuryuzai no seiho). Text in Japanese. (Osaka Gas Co., Ltd. (Japan)) Japan. Pat. Sho 50-10840. 6p., April 24, 1975. (Appl. April 14, 1969, 1 claim).*

An adsorptive desulfurizer consisting of iron oxide was developed using waste iron oxide from a steel rotary kiln consisting primarily of gamma ferric oxide as a raw material. A mixture consisting of waste iron oxide, an alkali substance such as sodium carbonate, ammonium carbonate, sodium bicarbonate, or ammonia and water is dried, molded into tablets with porosity above 30%, and reduced at temperatures above 400 C for longer than four hours using reducing gas such as hydrogen gas or H_2 gas containing carbon monoxide at gas space velocity of less than 300/hour. Data of the relationship between reduction temperature and porosity and physical properties are given. The adsorption rate of sulfur measured was in the range of 1.5-4.9 wt%.

52207 **APTIC NO. 74778**

Shimizu, T., M. Murata, T. Osada, A. Kobayashi, and E. Kusunoki

CLEANING METHOD FOR NITROGEN OXIDES CONTAINING WASTE GASES. *(Chisso sankabutsu o konyu suru haigasu no shori hoho). Text in Japanese. (Tore Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho. 50-4194. 3p., Feb. 15, 1975. (Appl. March 6, 1970, 1 claim).*

A cleaning system of waste gas containing nitrogen oxides was developed. The apparatus described can be applied to chemical and metal mining companies. The efficiency of this device is much higher than that of any other previously used methods in spite of its low operating cost. The cleaning of such waste gases containing nitrogen dioxide and nitric oxide can be performed by contact with oxygen gas and wood charcoal which is made from wood through the process of dry distillation. This wood charcoal has better performance than activated charcoal for the present purpose. The operation should be carried out in a temperature range from 200 to 270 C. Specimen gas which consists of 3% of a mixture of NO and NO_2, 4% of O_2, and 93% of nitrogen gas was cleaned to 100 ppm concentration of nitrogen oxides after passing through a 4.7 cm diameter glass tube which contained 26.5 g of wood charcoal at 5 cm/sec gas line speed.

52208 **APTIC NO. 74741**

Sugiura, A.

HARSHAW S DEDUSTING PROCESS. *Harshaw sha no bojin process ni tsuite). Text in Japanese. Nikkakyo Geppo (Mon. Bull. Jap. Chem. Ind. Assoc.), 28(4):180-182, April 1975.*

A dust removing process developed by the Harshaw Chemical Co. is described. The process uses Teflon K as an additive to dusts. The Teflon K, as powder or in dispersed form, forms a net of very fine holes when shearing force is applied at elevated temperature. Dusts are trapped in the fine holes and are easily recovered without altering their physical and chemical properties. The amounts of Teflon K used are usually between 0.1% and 0.005%, and they are thoroughly mixed with the dusts before heating and shearing forces are applied. More than 150 different kinds of Teflon K have been developed and are suitable for various pigment dusts which contain cadmium, lead, arsenic, chlorides, and glass wool, and for pesticides, inorganic chemicals, and metal powders.

52209 **APTIC NO. 74767**

Suzuki, Kenishiro and Yasuhisa Monoi

COUNTERMEASURES AGAINST ODORS OF ORGANIC SOLVENTS AND THE RESULTS. *(Yuki yozai no akushu taisaku to sono seika). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 20(5):403-410, May 1975.*

A deodorizing apparatus specially designed for use in the printing, painting, and coating industry is described. The solvents used in these industries are all flammable, but they are too dilute to employ destructive combustion. The apparatus developed recently makes use of a platinum or palladium catalyst on active alumina. The design capacity of the apparatus is 30-500 normal cu m/min. For effective oxidation of solvents in the catalyst layer, preheating of the gas to 250-300 C is necessary. For the preheating, propane or kerosene is used. Special care must be taken to avoid a fire or explosion. For this purpose, purging of the space is designed to proceed automatically. An automatic flame detector is also equipped to avoid accidents; a rod electrode is used for this purpose. An emergency cut-off valve is also installed. This valve operates when concentrated solvent vapor is present, the temperature becomes extraordinarily high, the pilot burner malfunctions, or when the blower stops rotating. An automatic temperature regulator is installed in the catalyst layer because it is necessary to keep the temperature above 250 C for effective oxidation of the solvent vapor.

52210 **APTIC NO. 74910**

Suzuki, K., T. Saito, H. Yamada, and H. Hirata

STUDY OF EMISSION GAS CONTROL OF GAS TURBINE COMBUSTION FOR AIRCRAFT. *(Kokuyo gasu tabin nenshoki no okeru haiki seigyo no kenkyu). Text in Japanese. Koku Uchu Gijutsu Kenkyusho Shiryo (Tech. Mem. Natl. Aerosp. Lab.), Rept. TM-247, 15p., Jan. 1975. 3 refs.*

The control of nitrogen oxide emissions from aircraft gas turbines was studied using mock-up burners and a mock-up turbo fan. The nitric oxide/NOx concentration ratio seemed to be the key point in the reduction of NOx. If the NO/NOx concentration ratio was close to one, it was possible to reduce NOx emission; but if it was close to 0.2, any further reduction was difficult. In order to reduce the NO/NOx concentration ratio, it was useful to reduce the fuel-air volume ratio in the combustion area, bringing it down to 0.8 or less. For pre-mixing combustion, residual oxygen around the exit of the combustion area was more than 5%. Uneven combustion, like jet spray combustion, showed a higher residual oxygen. The maximum cross-section average wind velocity of the burner was made larger. Under certain conditions, jet spray combustion is more practical than pre-mixing combustion in reducing the NO/NOx concentration ratio. Increasing the penetration distance of the fuel resulted in a more even dispersal of the fuel within the combustion area. As opposed to a pure luminous flame, white luminous flames, transparent yellow or orange, purplish-orange, and pink flames were advantageous. However, under high pressure a luminous flame was apt to appear, indicating the possible necessity of changing the fuel jet spray method.

52211 **APTIC NO. 74809**

Taniguni, Koichiro, Hitoshi Izumi, Terutomo Matsui, and Keiji Yoshimoto

A PORTABLE DUST COLLECTOR. *(Kananshiki shujin sochi). Text in Japanese. (Hitachi Shipbuilding and Engineering Co., Ltd. (Japan)) Japan. Model Util. Sho 50-15666. 3p., May 15, 1975. (Appl. April 1, 1971, 1 claim).*

The portable dust collector described here is designed for convenient use with operations such inboard sandblasting tanks. The dust collector consists of a flexible tube with a suction inlet with exhaust fan at one end and an outlet at the other end and a rigid cylindrical liquid scrubbing tube located about midway down the flexible tube. The liquid scrubbing tube consists of a pressurized water inlet pipe and numerous branches of water pipes arranged so that the spray nozzles are located along the circumference at given intervals and many levels. The water spray nozzles are pointed so that the water mist is sprayed toward the center. The suspended dust particulates are adsorbed on the water mist while passing through the scrubbing tube and are disposed with the water. The outer shell of the water scrubbing tube can be opened for cleaning and maintenance. The dust collecto is also equipped with hardware so as to allow it to be attached readily to stationary objects.

52212 **APTIC NO. 74371**

Tejima, Tsuguhiko

CATALYSTS FOR SULFUR RECOVERY. *(Iou kaishuyo shokubai). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochem.), 19(3):61-65, March 1975. 3 refs.*

Important features of catalysts used in Claus sulfur recovery processes are reviewed. Single step Claus operation provides only 60% desulfurization due to the exothermic reaction of the process; hence, three steps are generally employed to obtain a 96% to 98% efficiency which also depends on the type of catalyst used. Deterioration of catalytic activity must be small for a continuous operation, and the pressure loss within the reactor must be minimized. Such a pressure loss is accompanied by the deposition of sulfur and carbon on the catalyst bed and by pulverization of the catalyst during the reaction. The deposition of sulfur and carbon can be avoided by carefully maintaining the reaction temperature near 250 C and by using a hard catalyst to minimize pulverization. The hydrolysis of carbonyl sulfide emissions by the same catalyst is also desirable. An alumina catalyst is better than a bauxite catalyst with respect to COS hydrolysis. The catalytic activity (COS hydrolysis) of bauxite after 20 hr of continuous reaction drops to 40% of its initial activity, while alumina maintains the same catalytic activity after 200 yr of reaction. The hardness of alumina is also superior to that of bauxite; the relative pulverization after 90 min of continuous reaction is 8% for bauxite and 0.1% for alumina. The three-step Claus process with an alumina catalyst provides nearly 98% desulfurization efficiency.

52213 **APTIC NO. 74489**

Teshirogi, N. and K. Ohashi

COMBUSTION CONTROL OF DIESEL ENGINE BY THERMAL PLANE. *(Netsumen ni yoru diizeru kikan no nensho togyo). Text in Japanese. Nippon Kikai Gakkai Ronbunshu (Trans. Japan. Soc. Mech. Engrs.), 41(344):1263-1272, April 1975. 13 refs.*

Experiments on a diesel engine to see if positive adjustment of the temperature of the combustion chamber wall would help control combustion were performed. The effects of the combustion chamber temperature and combustion process on nitrogen oxide emission were also assessed. A whirlwind-type combustion chamber in which the wall temperature was freely controlled between 250 C and 600 C, was attached to a two-cycle engine; and fuel delivery directions were changed, allowing one combustion per 4 rotations to occur. Irrespective of fuel direction, delay in ignition became shorter, the higher the temperature of the wall, and remained constant above 450-500 C. The minimum wall temperature necessary for sure ignition was within the range of 250-400 C, depending on the fuel direction. When the fuel shooting angle was 80 deg, with most of spray adhering to the wall, the maximum temperature was required. The rate of maximum pressure rise decreased, the higher the wall temperature. It decreased also when the shooting angle became greater. Maximum combustion rate occurred during the premixing combustion period and at initial combustion; when the wall temperature was raised, it was lowered. When the shooting angle was 30 deg, raising the wall temperature from 300 to 550 C resulted in a decrease from 12%/deg to 8%/deg. When shooting angle became greater, the ratio decreased. At an 80 deg shooting angle, it was 3%/deg. The combustion ratio was lower, the greater the shooting angle; but by raising the wall temperature, it was greatly improved. Nitrogen oxide emission was lowered when the wall temperature was raised, although the average effective pressure was lowered also when the wall temperature increased. The above suggests that NOx generation may be controlled by changing the combustion process, without losing power. Irrespective of shooting angle, NOx emission increased in proportion to the combustion degree during the premixing combustion period.

52214 **APTIC NO. 74476**

Teshirogi, T.

CONTROL OF NITROGEN OXIDE GENERATION IN THE INTERNAL COMBUSTION ENGINE. *(Naien Kikan ni okeru chissosankabutsu no seisei yokusei hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-3445. 3p., Feb. 5, 1975. (Appl. Oct. 18, 1971, 1 claim).*

The suppression of the rate of nitrogen oxide generation in the internal combustion engine using the water suppression technique is discussed. The important innovation in this claim is the location of the water outlet and the system for controlling othe amount of water. The location of the water outlet should be where the temperature in the engine is highest in the vicinity of the spark plugs. The amount of water should be adjustable depending on the fuel flow. Water should be added at high load and shut down at low load. The control of the amount of water can be achieved by linking control of the water system with control of the throttle valve of the fuel system.

52215 **APTIC NO. 76641**

Todo, Naoyuki, Toshio Sato, and Yoshihiro Sugi

A REDUCTIVE REMOVING METHOD FOR NITROGEN OXIDES IN COMBUSTOR EXHAUST GAS CONTAINING OXYGEN. *(Sanso o ganyusuru nensho sochi haigasu ni fukumareru chisso sankabutsu no kangen jokyoho). Text in Japanese. (Director of Agency of Industrial Science and Technology (Japan)) Japan. Pat. Sho 50-12393. 5p., May 12, 1975. (Appl. March 13, 1973, 2 claims).*

The removal method for nitrogen oxides in combustor exhaust gas containing oxygen by catalytic reduction with ammonia using cupric oxide or a mixture of CuO and chrome oxide carried on activated alumina and the removal method for NOx in combustor exhaust gas containing O2 by catalytic reduction with NH3 in the presence of sulfur dioxide using CyO or a mixture of CuO and Cr2O3 carried on activated alumina are described. The suitable CuO content in catalyst is in the range of 5-40 wt%, preferably 10-20 wt%. The catalytic activity is increased by thhe addition of Cr2O3 in the amount of 1-10 wt%, preferably 3-7 wt%. The reduction rate of nitric oxide is greatly increased by the presence of SO2, and the suitable concentration of SO2 in exhaust gas is 50-1400 ppm. The reduction temperatures to attain reduction rates of above 90% are in the range of 180-400 C and 280-500 C in the presence of SO2. The amount of NH3 is 1-3 times the stoichiometric quantity required for NOx reduction, preferably 1.5 times.

52216 **APTIC NO. 74875**

Tonouchi, M., K. Shimizu, S. Nagata, G. Sugiura, M. Endo, and G. Urinin

DEODORIZATION TEST ON DRYING OF FOWL DROPPINGS BY THE USE OF VINYL HOUSES. *(Vinyl house riyo no keifun kanso ni okeru shoshu shiken). Text in Japanese. Tokyo-to Chikusan Shikenjo Kenkyu Hokoku (Res. Rept. Anim. Husb. Exp. Stn., Tokyo), no. 14:103-109, March 1975.*

The use of various charcoals for reducing the odor emissions from operations involving the drying of fowl droppings was investigated. The charcoal was mixed with wood vinegar. A vacuum gas detector for ammonia was used; thus ammonia was used as the measure of odor. After deodorization in the charcoal layer, odors were hardly detectable from the charcoal. Little difference was found between the performances of various charcoals. After about 10 days the charcoal became saturated, and the deodorization was incomplete. However, the charcoal layer could be used over 2 mo. The use of acetic acid in the place of wood vinegar was not successful because some stimulating odor was generated.

52217 **APTIC NO. 74506**

Torii, T.

PRESENT STATE OF LOW NOX BURNERS AND THEIR ACTUAL EXAMPLES. *(Genjo ni okeru tei NOx boira bana to sono jitsurei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(5):42-46, May 1975.*

The nitrogen oxides emission rate of rotary oil burners is relatively low due to the comparatively shorter residence time of combustion gas at high temperature regions and lower maximum flame temperature. The NOx values of existing Sanrei rotary oil burners (no NOx control device) are in the range of 60-180 ppm depending on the fuel type. The NOx reduction measures for Sanrei oil burners are described with measurement data. The NOx reduction by multi-stage combustion is achieved by proper distribution of air; however, the reduction rate varies depending on the combustion conditions (20-25% at maximum combustion rate). In the case of emulsion combustion, the NOx is reduced by 20% when 20-25% of water is added. The NOx reduction by modification of burner tip, exhaust gas recirculation and accurate control of air-fuel ratio is also described. A description of Sanrei gas burner LG Models (LGL, LGH and LGS models) developed with low NOx features by means of multistage combustion is given.

52218 **APTIC NO. 74403**

Tsuboi, N., S. Okada, and M. Toba

INERTIAL SEPARATION TYPE FILTER. *(Kansei bunri gata firuta). Text in Japanese. (Hitachi Seisakusho Co., Ltd., Tokyo (Japan) Japan. Pat. Sho 50-6671. 4p., March 17, 1975. (Appl. March 19, 1971, 1 claim).*

The modification of inertial type dust separation filters for railroad trains is described. The inertial separator consists of a cone-shaped air path the wall of which is lowered and a dust collection duct at the end of the cone. The axis of the cone is parallel to the side wall of the vehicle, and the air which is to be cleaned is introduced from the wall side of the vehicle. One example of the present modification is the installation of a recoil plate at a location opposite the site of the air inlet from the symmetric axis and slightly inner part of the cone such that dust recoiling from the newly installed plate can directly reach the dust collection duct without leakage through the louvered wall. The location and the dimension of the recoil plate determine the efficiency of air cleaning.

52219 **APTIC NO. 74477**

Tsuji, M.

PRESENT STATE OF LOW NOX BURNERS AND THEIR ACTUAL EXAMPLES. *(Genjo ni okeru tei NOx bana to sono jitsurei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(5):33-37, May 1975.*

Six new burners for different combustion methods are described. Burner N-1 is a pressure-injection divided-flame burner and N-2 is a steam-injection divided-flame burner. Both burners use a group of small flames. Burner N-3 is a multi-stage steam-injection long flame burner which uses a small burner of large nozzles as well as a large number of small nozzles to give a multi-stage long flame. Burner N-4 is a circulation swirl mixing burner which supplies fuel only to the circulation region. Burner N-5 is a circle-type flat flame burner and N-6 is a fan-type flat flame burner, both featuring a thin flame which spreads to a large area. A cylindrical furnace 15 m in length and 7 m in diameter was used to test the burners. Heavy oil (C-grade) at 80 C was supplied at 4000 l/hr. Burners N-1 and N-2 gave a nitrogen oxides concentration (at 4% O2) of 53 ppm and 42 ppm, respectively. Burner N-3 showed slightly reduced NOx concentration as compared to conventional burners. The NOx reducing effect of N-5 was higher than that of N-3 but lower than that of N-1 and N-2. Burners N-4 and N-6 showed remarkable NOx reducing effects, but also gave high particulates concentrations.

52220 **APTIC NO. 74518**

Vekeny, Henrik

EFFECT OF THE DIRECTION OF VENTILATION AIR FLOW ON DUST CONCENTRATION IN BROAD-FRONT GALLERIES. *(A szellozteto legaram iranyanak hatasa a szeleshomloku fejtesek porterheltsegere). Text in Hungarian. Banyasz. Kohasz. Lapok, Banyaszat, 108(1 and 2):40-45, Jan.-Feb. 1975. 6 refs.*

Calculations and observations concerning the effect of the direction of ventilation air flow on the dust concentration in broad-front galleries of coal mines are presented. The galleries considered are sloped, with a front breadth of 80 m and a ventilation flow rate of 400 cu m/min. Calculations and comparisons with earlier concentration measurements reveal a reduction of at least 40% in the dust load in the galleries when the ventilation air flow direction is in the downward transportation direction as opposed to opposite the transportation direction. A reduction in the dust load of this magnitude is expected to result in a decrease of almost 50% in the incidence of pneumoconioses among exposed miners.

52221 **APTIC NO. 74963**

Watanabe, S.

ON THE DEVELOPMENTAL STUDY OF A NOX REMOVAL CATALYST AS ONE OF THE RECYCLING TECHNIQUES OF NATURAL RESOURCES. *(Shigen junkan gijutsu no ikkan to shiteno chissosankabutsu jokoyo shokubai no kaihatsu kenkyu ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(2):121-127, Feb. 1975.*

Pollution control and ways of recycling natural resources was studied by the Osaka Municipal Technical Research Institute. One aspect studied was the reuse of industrial waters. The use of catalysts in the reduction of nitrogen oxides by ammonia was studied. The most effective catalysts consumed NH3 stoichiometrically in the reduction of NOx and were economical. The catalyst used in this study was metallic molybdenum deposited on alumina.

52222 **APTIC NO. 74543**

Watanabe, Tamotsu

CLEANING METHOD AND APPARATUS FOR POLLUTED GAS. *(Osen kitai no seijo hoho oyobi sochi). Text in Japanese. (Nihon Kogei Ind. Co. Ltd., Tokyo Japan) Japan. Pat. Sho 50-6391. 4p., March 13, 1975. (Appl. July 7, 1970, 1 claim).*

An apparatus for removing small particles from polluted gases is described. The apparatus consists of two electrodes and liquid spray nozzles. When polluted gases pass between the electrodes, small particles in the gas are ionized and deposited onto the surface of the anode. A solution is sprayed from the anode, washing out the deposited particles. The liquid solution produces an electrostatic reaction which removes additional particles from the gas. The sprayed liquid can be recirculated after passing through a dust particle. The liquid solution can be water, alkaline solution, or acid solution depending upon the characteristics of the dust particles in the gas. The efficiency of the method depends upon the appropriate selection of liquid solution.

52223 **APTIC NO. 74906**

Watanabe, Toshihiro

ELIMINATION OF ODOROUS GASES BY ADSORPTION. *(Kyuchaku-ho ni yoru akushu gas jokyo). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 20(5):395-398, May 1975. 1 ref.*

Materials for the adsorption of odorous gases are reviewed. A product consisting mainly of iron hydroxide is used for the adsorption of acidic gases such as hydrogen sulfide. The mechanism of adsorpition is neutralization and salt formation. A product consisting of nitrofumine, which is obtained by the reaction between coal and dilute nitric acid, and sulfonized carbon, which is obtained by the reaction between coal and concentrated sulfuric acid, is excellent for the adsorption of alkaline gases such as ammonia and amines. Star Coal, a trade name, is made from a carbonaceous material which is obtained by low temperature distillation of coal and plant body. The carbonaceous material is made to react with steam and waste gases after combustion. By this treatment, a porous structure is introduced. The specific surface area of this material is as wide as 700-1500 sq m/g. The mean pore diameter is 12-40 A. Star Coal G-AC is especially suited for the adsorption of odorus gases. The adsorption apparatus is either a reactivated type or a non-reactivated type.

52224 **APTIC NO. 74770**

Yamada, H.

NINETY-FIVE PERCENT REDUCTION OF SULFUR DIOXIDE DISCHARGE BY THE ADOPTION OF A LATEST APPARATUS. *(Saishinshiki sochi no setchi de io sankabutsu no haishutsu-ryo o 95% sakugen). Text in Japanese. (Puranto Enjinia (Plant Eng.), 7(5):65-71, March 1975. 1 ref.*

Reductions in sulfur dioxide emissions at the Chiba refinery are reported. The refinery installed a new desulfurization system and succeeded in reducing the sulfur oxide discharge by as much as 95%. The planned sulfur oxide discharge is 171 normal cu m/hr by the end of March 1978. The apparatus was developed by Shell Oil Company and removes sulfur oxides from the stack smoke. The discharge of the nitrogen oxides is also being reduced. The reduction is to be done in three stages. In the first stage, combustion will be improved. In the second stage, gaseous fuels will be mixed in larger percentages, and in the third stage, a nitrogen oxide remover will be installed. Improvements are also being made in the discharge of dust and odors.

52225 **APTIC NO. 74437**

Yamaguchi, Takaaki

PROBLEMS IN OIL REFINING TECHNIQUES. POLLUTION CONTROL TECHNIQUES. *(Sekiyu seisei gijutsu no kadai. --Kogai boshi gijutsu o chushin ni). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochem.), 19(5):69-72, May 1975.*

Environmental pollution control techniques in the field of oil refining are reviewed. Air pollution topics dicussed include the reduction of sulfur content for the purpose of reducing sulfur oxides emission by means of hydrodesulfurization of heavy oil (capacity 930,000 bbl/day) and cracking and gasification of heavy oil (1-2 facilities), production of no-lead gasoline after April 1974, reduction of nitrogen oxides by means of combustion modification (low NOx burner, exhaust gas recirculation, and two-stage combustion) and denitrification of exhaust gas, reduction in particulate matter from stationary and mobile sources, and reduction in hydrocarbon emissions (photochemical smog) are discussed with reference to the environmental standard and emission standard. Water pollution topics covered are problems concerning seven pollutants (including cadmium, cyan, and lead) and pH, chemical oxygen demand, biological oxygen demand, SS, and oil content as hazards to health. Safety measures for oil refineries are discussed with reference to two recent major accidents: the massive spillage from oil tanks at Mitsubishi Sekiyu Co. and the explosion and fire at Daikyo Sekiyu Co.

52226 **APTIC NO. 74338**

Yamanaka, Tatsuo

CATALYSTS FOR TREATMENT OF ORGANIC SOLVENTS AND OFFENSIVE ODOR. *(Yuki yozai oyobi akushu shoriyo shokubai). Text in Japanese. Seikiyu to Sekiyu Kagaku (Petrol. Petrochem.), 19(3):67-72, March 1975. 4 refs.*

The catalytic treatment of organic solvents and odors is discussed. The catalytic activity of metal oxides increases with decreasing heat of formation. The catalytic activity for the oxidation of hydrocarbons decreased in the order of palladium, platinum, cobalt oxide, lead oxide, chromium oxide, manganese oxide, copper oxide, cerium oxide, iron oxide vanadium oxide, nickel oxide, molybdenum oxide, and titanium oxide. More than 80% of the hydrocarbons in automotive exhaust are oxidized at 180 C by using platinum-alumina, while only 56% are converted at 510 C by using copper chromium oxide. The firing point of toluene, xylene, phenol, methanol, butanol, acetone, methyl ethyl ketone, acetic acid, and ammonia with and without noble metal catalysts are 552 and 160 C, 482 and 160 C, 700 and 180 C, 464 and 20 C, 343 and 150 C, 650 and 130 C, 516 and 145 C, 427 and 217 C, and 651 and 210 C, respectively. Treatment of aromatic hydrocarbons, alcohols, aldehydes, and acids at 240 ppm to 740 ppm with 0.1% Pt-Al2O3 at a temperature below 350 C and with a catalyst bed thickness of 5 cm resulted in nearly 100% conversion. Methyl mercaptan and dimethyl sulfide at 10 ppm and 20 ppm, respectively, were treated by the same catalyst at 300 C, and the resulting gases are odorless.

52227 **APTIC NO. 74794**

Yamanata, Tatsuo

CATALYSTS FOR TREATMENT OF ORGANIC SOLVENTS AND OFFENSIVE ODOR. *(Yuki yozai oyobi akushu shori shokubai). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochem.), 19(3):67-72, March 1975.*

A general discussion is given concerning the catalytic treatment of organic solvents and odors. The catalytic activity for the oxidation of hydrocarbons decreased in the order of palladium, platinum, cobalto-colbaltic oxide, palladium oxide, chromic oxide, manganic oxide, cupric oxide, ceric oxide, ferric oxide, vanadium pentoxide, nickel oxide, molybdenum trioxide, and titanium dioxide. The firing point of toluene, xylene, phenol, methanol, butanol, acetone, methyl ethyl ketone, acetic acid and ammonia with and without catalysts of the noble metal system are 552 and 160 C, 482 and 160 C, 700 and 180 C, 464 and 20 C, 343 and 150 C, 650 and 130 C, 516 and 145 C, 427 and 217 C, and 651 and 210 C, respectively. Treatment of aromatic hydrocarbons, alcohols, aldehydes and acids at 240 ppm to 740 ppm with 0.1% platinum-alumina at temperatures below 350 C and at 5 cm catalyst bed thickness resulted in nearly 100% conversion. Methyl mercaptan and dimethyl sulfide at 10 ppm and 20 ppm, respectively, were treated by the same catalyst at 300 C and the resulting gases were odorless.

52228 **APTIC NO. 74475**

Yasuda, K., K. Natsukawa, K. Hiramatsu, M. Mito, Y. Sakamoto, and S. Narikawa

A TREATMENT METHOD FOR AN EXHAUST CONTAMINANT CONTAINING SOLVENTS AND MONOMERS. *(Yozai monoma nado o fukumu haiki no shori). Text in Japanese. Preprint, Osaka Prefecture Industrial Research Inst., Osaka, 2p., 1975. (Presented at the Osaka Prefecture Industrial Research Institute Meeting, Osaka, Japan, June 15, 1975.)*

The chemical absorption, adsorption, and contact combustion methods studied for use in small factories as a means of treating exhausts containing organic solvents and monomers. The chemical absorption method was not appropriate for this use. The adsorption method, which was examined using activated charcoal as an adsorbent was efficient for any contaminant. Quick reactivation of adsorbent at higher temperature is suggested for increased efficiency. The removal rate in the contact combustion method, which was examined by the use of a platinium catalyst, depended greatly on the combustion temperature and the concentration of the contaminant. Every contaminant must to be treated at a particular temperature. High efficiency cannot be expected for multi-contaminant exhaust gases.

52229 **APTIC NO. 74400**

Yasuoka, M.

NOX CONTROL MEASURE BY FUEL CONVERSION: FROM HEAVY OIL TO CITY GAS. *(Nenryo tenkan ni yoru NOx yokusei taisaku: juyu kara toshi gas e). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(5):29-33, 1975.*

Fuel conversion from heavy oil to city gas for nitrogen oxide control at cast-forging factories is described. The conversion took 2 yr and cost $900,000. The maximum flue gas emission rate from single furnaces in the factories was 4000 normal cu m/hr, making the installation of denitrification equipment impractical. By utilizing low NOx burners, a 30 ppm flue gas NOx level was achieved; this was well below the NOx emission standard of 220 ppm. The factories use 800,000 normal cu m/mo of city gas. Control of the combustion temperature of city gas was much more easily accomplished than for heavy oil combustion; the overall production cost for factories using more expensive city gas was twice that for heavy oil. Since the city gas contained less than 0.0028% sulfur, sulfur oxide, smoke, and soot emissions were not serious.

52230 **APTIC NO. 74777**

Yokota, N., S. Tokuda, Y. Ito, and H. Matsushita

REMOVAL METHOD OF MERCURY IN GAS. *(Gasu chu no suigin jokyo hoho). Text in Japanese. (Osaka Soda Co. Ltd., Osaka (Japan)) Japan. Pat. Sho. 50-6438. 3p., March 13, 1975. (Appl. Dec. 29, 1970, 1 claim).*

A technique for the separation of mercury from gas was developed. The method is more efficient and economical for practical use than any other similar method such as low temperature condensation or adsorption by molecular sieves. The method is performed by the contact of the gas which contains mercury with an anion exchanger which adsorbs iodine and/or iodide. A long life time of operation is provided. The best experimental data shows a reduction of the Hg concentration to 3 microngrams/cu m from an original test hydrogen gas which contained 5.500 micrograms/cu m of Hg after 10 hr of operation under a flow speed of 1.500 l/hr.

52231 **APTIC NO. 74795**

Yoneda, Takashi

FINEBALL, MALODOR BARRIER MATERIAL. *(Ekimen josan shuki boshizai, fainboru, ni tsuite). Text in Japanese. Kami-pa Gikyosu (J. Japan Tech. Assoc. Pulp Paper Ind.), 29(8):438-440, Aug. 1975.*

The use of polyethylene resin balls to prevent the evaporation of odorous compounds from the surface of waste water treating baths such as clarifiers in the pulp industry is described. The balls are shaped like hemispheres, and their center of gravity is at the flat portion of the ball, thus assuring that the flat side always contacts the surface of the bath. More than 90% of the bath surface can be covered to prevent the evaporation of volatile compounds into the air. The polyethylene resin is chemically stable, except to strong acids, and is also easy to mold. The addition of 2% carbon black to the polyethylene improves the weather resistance of the ball. When the balls were used to cover the surface of a clarifier at a pulp mill, the hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide concentrations at 2 m above the liquid surface were considerably lowered. The total level of the four compounds was 16.6 to 82 ppb with the balls and 830 to 2800 ppb without them.

52232 **APTIC NO. 74668**

Yoshida, T.

NOX REDUCTION MEASURES BY COMBUSTION TECHNIQUE AND ITS ACTUAL STATUS. *(Nensho gijutsu ni yoru NOx teigen taisaku to sono jishi jokyo). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(5):64-69, May 1975.*

Off-stoichiometric combustion, two-stage combustion, and exhaust gas recirculation techniques were tested for nitrogen oxides reduction in combustion gases from boilers of various capacities. A reduction of more than 25% of NOx was possible for an auto-bias atomizer at optimum combustion conditions including furnace shape, burner arrangement, and furnace load. Further reduction could be achieved when two or more than two burners were used, accompanied with two-stage combustion. The relative positions of the burner and air nozzles were essential in two-stage combustion. A rate of recirculation below 30-35% was desirable for exhaust gas recirculation. A combination of two-stage combustion and exhaust gas recirculation resulted in even better NOx reduction. It is unreasonable to expect a synergetic effect for all boilers by combining the two methods, but up to 50% NOx reduction could generally be achieved at optimum combustion conditions.

52233 **APTIC NO. 74790**

Yoshiike, T.

CHANGE OF HEAVY OIL TO URBAN GAS AND KEROSENE MIXED COMBUSTION. *(Juyu kara toshi gas/toyu konsho e). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(5):17-24, 1975. 2 refs.*

An SC-210 S type boiler at the Ishigawajima Harima Co. was studied for the effects of fuel change. The boiler had a maximum pressure of 11 kg/sq cm and produced steam at 220 C. The combustion chamber had a volume of 21.5 cu m and the maximum capacity was 10 tons/hr. The oil burner was a steam injection type having a combustion range of 80-800 kg/hr, and the gas burner had a combustion range of 160-1600 N cu m/hr. The change from 100% LSA heavy oil to 50%-50% gas-kerosene combustion resulted in the reduction of nitrogen oxides (% oxygen drybase) from 160 ppm to 93 ppm and dust from 0.0652 g/N cu m to 0.0053 g/N cu m. The thermal efficiency by gas-kerosene mixed combustion was approximately the same as that by oil combustion, but gas combustion had a better thermal efficiency.

52234 **APTIC NO. 74993**

Yoshinori, Hideki

MASKING AS A MALODOR COUNTERMEASURE. *(Shuki taisaki ni okeru masukingu). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo, p. 46-47, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Masking of malodors by use of spices and spice essences was investigated. Masking materials were chosen experimentally by using an odor box, with ethyl mercaptan as the source of malodor. The effective masking compounds included cinnamic aldehydes, citral, vanillin, 1,8-cineole, acetophenone, allyl caproate, allyl cyclopropionate, camphor, and borneol. Ineffective compounds included anise alcohol; cinnamic alcohol; terpineol, and citronellol. Effective masking compounds were field-tested by injecting the masking agent into a stack and vaporizing it by means of steam or compressed air. Another method was to diffuse the agent in scrubber wash liquid and circulate it with the liquid. In general, for exhaust volumes of 100,000 cu m/hr, 10 cc/min of masking agent were used. A panel was assembled at predetermined distances from the stacks and as the masking agent was introduced in steps, opinions were solicited. Malodors from seven kraft pulp factories and one chemical pulp factory were modified. About 84% of the monitors claimed that odors had been ameliorated by varying degrees. About 87% of the monitors claimed that spice odors were an improvement. When malodor concentrations are high, favorable results are not obtained.

52235 **APTIC NO. 74352**

DEVELOPMENT OF TECHNOLOGY TO PREVENT EMISSION OF NITROGEN OXIDES FROM STATIONARY SOURCES.

(Kotei hasseigen ni kakawaru chisso sankabutsu no haishutsu boshi gijutsu no kaihatsu jokyo ni tsuite). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 10(1):3-23, Jan. 1975.

Technology to prevent the emission of nitrogen oxides is reviewed. Emission gas recycling and two-stage combustion reduce NOx emissions by 20-40%, whether applied singly or together. By installing a low NOx burner, emissions from smaller boilers andd heating furnaces are reduced by 25-40%. Although theree are not sufficient data, NOx can be reduced by 50% using low-nitrogen fuel, especially when light oil and gas are used, together with the above control methods. The technology of stack smoke denitrification has reached the practical application stage. The cost of denitrification varies greatly, depending upon whether it is combined with desulfurization or not; the cost is no different than that for desulfurization. The application of denitrification technology to sintering furnaces is more difficult; however, experience gained in dentrification of NOx from boilers can be applied.

52236 **APTIC NO. 74382**

DEVELOPMENT IN NOX CONTROL TECHNIQUES BY INDIVIDUAL COMPANY -- PREVENTION OF NOX FORMATION AND FLUE GAS DENITRIFICATION.

(NOX boshi gijutsu no mekabetsu kainhatsu jokyo -- NOx seisei yokuseiho to haien dasshoho ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), vol. 1975:45-48, Jan. 1975.

The status of the development of nitrogen oxides control techniques by individual companies is reviewed. Major projects being undertaken by various companies as follows. Sumitomo Chemical Industrial Co.: dry-type selective catalytic reduction method using ammonia as reducing agent for large scale industrial furnaces. Hitachi Zosen Co.: dry-type selective catalytic reduction method using NH_3 and carbon monoxide for sintering furnace. Mitsubishi Zyuko Co.: dry-type catalytic reduction using NH_3 and wet-type oxidation absorption method using ozone as oxidizing agent. Babukokku Hitachi Co.: dry-type selective catalytic reduction method using NH_3. Mitsubishi Kakoki Co.: dry-type catalytic reduction method using NH_3. Ishikawajima Harima Zyukogyo Co.: dry-type catalytic reduction method using NH_3. Fuji Kasui Co.: combination of desulfurization and denitrification methods (oxidation--reduction) using chlorine dioxide or O_3 as oxidizing agent and desulfurization absorbent as reducing agent. Chiyoda Kako Kensetsu Co.: oxidation absorption method using O_3. Mitsubishi Kinzoku Co.: denitrification using basic aqueous potassium permanganate solution as absorbent. Kureha Kagaku Kogyo Co.: sodium sulfite and sodium acetate absorption method. Kawasaki Zyuko Co.: wet-type flue gas denitrification device by the magnesium method and gypsum method. Showa Denko Co.: flue gas desulfurization and denitrification by the sodium sulfite method.

52237 **APTIC NO. 74417**

DEVELOPMENT OF CATALYSTS FOR FLUE GAS DENITRIFICATION TECHNIQUE.

(Haien datsusho gijutsu ni okeru shokubai kaihatsu ni tsuite). Text in Japanese. Denkenho Rept. Inst. Electr.), no. 35:1-7, 1975.

Catalysts for both dry and wet flue gas denitrification processes were studied. A mixed solution of sodium sulfite and sodium bisulfite was used as the absorbing solution in the wet denitrification process. The addition of inorganic or organic ferrous salts to the absorbing solution increased the denitrication efficiency, while the addition of metal salts other than ferrous ion did not improve the efficiency. The denitrification efficiencies obtained with 0.3% ferrous sulfate, 0.4% ferric sulfate, 1% nickel sulfate, 1% ferrous chloride, 1% ferric chloride, 1% chromium chloride, and 1% cobalt chloride were 95%, 75%, 5%, 91%, 65%, 18%, and 20%, respectively; while the absorbing solution without a catalyst gave a 15% denitrification efficiency. The use of metal chelates such as ethylenediaminetetraacetic acid increased the denitrification efficiency even further. The efficiencies with 0.01 M Fe(II)-EDTA and Fe(III)-EDTA were 98% and 97%, respectively. The metal chelate catalysts prevented the formation of metal hydroxides in higher pH solutions; therefore, the denitrification occurred even in an alkaline solution. Increased sodium sulfite concentration increased the denitrification efficiency which generally leveled out. The denitrification efficiencies of 0.2% and 0.4% sodium sulfite solutions with an Fe(II)-EDTA catalyst were 0% and 98%, respectively. A high desulfurization efficiency was also obtained with this wet denitrification method. The addition of surfactants to the absorbing solution increased the denitrification efficiency, in which more efficient contact between nitrogen oxides and absorbing liquid resulted therefore the use of smaller quantity of absorbing solution was permitted. About 80 different types of catalysts were tested for a dry denitrification method in which ammonia gas was used. The best catalyst which was not poisoned in the presence of SO_2 was the copper-bauxite, chromium-alumina, and vanadium- alumina, and these catalysts gave more than 80% denitrification efficiency. A similar efficiency could be obtained from the iron-alumina, cobalt-alumina, and nickel-alumina if no SO_2 was presented in the same gas. The reaction temperature used in the dry method was between 100 C to 500 C.

52238 **APTIC NO. 74469**

Environmental Agency (Japan), Atmospheric Div.

PRESENT DEVELOPMENT IN NITROGEN OXIDES EMISSION CONTROL TECHNOLOGY FOR STATIONARY SOURCES (II).

(Kotei hasseigen ni kakaru chisso sankabutsu no haishutsu boshi gijutsu kaihatsu no genjo, II). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(3):37-43, 1975.

Nitrogen oxides emission control techniques by low NOx burners are described. The mix-promotion method utilizes a fast mixing technique by allowing air and fuel to collide at right angles for the formation of a conical shape thin flame. The flame dividing method uses lower flame temperature and shorter stopping time by dividng the flame into the number of small independent flames. The self-flame recirculates part of the waste gas to reduce the combustion temperature. Two-stage combustion uses low oxygen concentration for the first stage combustion. Six new burners with different flame shape were developed in recent years. Burner N-1 is a pressure- injection flame dividing burner and N-2 is a steam-injection flame dividing burner, both utilizing low combustion temperature and short stopping time. Burner N-3 is a step-by-step steam-injection long flame burner which aims for homogeneous and low temperature flame. Burner N-4 is a circulation swirl mix-combustion burner which prevents prompt temperature increase in the first combustion zone. Burners N-5 and N-6, a circle type and fan type burner, use large combustion area for fast heat release.

52239 **APTIC NO. 74547**

PRODUCTION LINE AND EXHAUST GAS MEASUREMENT TECHNIQUES OF A LOW POLLUTION AUTOMOBILE, HONDA GIKEN. *(Teikogaisha no rain to haigasu sokutei gijutsu, Honda Giken). Text in Japanese. Denshi Gijutsu (Electron. Technol.), 17(4):April 1975.*

In the fall of 1972, Honda produced a clean engine using a subcombustion system, and in 1973 installed this Compound Vortex Controlled Combustion (CVCC) engine, in the four-door Civil model. This engine meets the 1975 automobile exhaust standards. In the factory, the exhaust gas from all finished cars is analyzed for carbon monoxide, carbon dioxide, hydrocarbons, and nitrogen oxide.

52240 **APTIC NO. 74651**

INSTRUCTIONS FOR THE CALCULATION OF ATMOSPHERIC DISPERSION OF INDUSTRIAL EMISSIONS. *(Ukazaniya po raschetu rasseyivaniya v atmosfere vybrosov predpriyatiy). Text in Russian. Byull. Stroit. Tekhn., no. 1:18-21, 1975.*

Instructions for the calculation of atmospheric dispersion of industrial emissions are presented. The dispersion of pollutant substances undergoing total or partial chemical conversion into more toxic compounds are calculated for the most toxic form. The calculations cover all pollutants actually emitted, rather than dust and sulfur dioxide alone. The summation of the effect of different pollutants are taken into account. Maximum ground level concentrations should not be higher than 80% of the maximum allowable concentration (MAC) value as determined for health resorts and recreational areas. The sum of the background concentration and of the calculated concentration for new or rebuilt emission sources should not be greater than the MAC value. Formula for the calculation of the maximum pollutant concentration at ground level at a certain distance from the emission sources and the extent of the sanitary protection zone are presented.

52241 **APTIC NO. 74682**

Environmental Agency (Japan), Air Quality Bureau, Air Pollution Control Div.

PRESENT CONDITION OF DEVELOPMENT OF NITROGEN OXIDES EMISSION PREVENTION TECHNIQUES CONCERNING STATIONARY SOURCES. *(Kotei hasseigen ni kakawaru chossosankabutsu no haishutsu boshi gijyutsu kaihatsu no genjyo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(5):582-590, May 1975.*

Nitrogen oxide prevention techniques developed by various industries are described. Pseudo-two-stage combustion techniques resulted in up to 35% NOx reduction for power plant boilers with oil or coal as fuel, while low excess-air and exhaust recirculation techniques gave only up to 22% NOx reduction. The NOx concentration in the exhaust after treatment by one of the above techniques was between 200 ppm and 250 ppm with heavy oil or coal as fuel. When a mixture of naphtha and heavy oil was used, the NOx concentration was further reduced to 150-160 ppm. The NOx emission concentration was aimed at below 100 ppm for new NOx burners using gas fuel. A low NOx burner by the Japan Furnace Co. for 100 kcal/hr and 400 kcal/hr furnaces using kerosene has reduced the NOx concentration to about 50 ppm. An RO-type burner by Daido Co., which recirculates part of the high temperature combustion gas to the fuel injection chamber, reduced NOx concentration to about 90 ppm at an air ratio of 1.15 compared to 300-380 ppm by a conventional burner. Other new burners developed at the Tokyo Gas Co., Mitsubishi Heavy Industries, Inc., and Ishikawajima Harima Heavy Industries, Inc. reduced NOx concentration to as low as 30 ppm. Dry- and wet-type flue gas denitrations techniques were also developed.

52242 **APTIC NO. 74787**

National Research Inst. for Pollution and Resources (Japan), Hitachi Ltd. (Japan), Badcock-Hitachi, K. K. (Japan), and Nippon Mining Co., Ltd. (Japan)

STUDIES ON COMBUSTION MODIFICATION TECHNIQUES TO CONTROL NITROGEN OXIDES EMISSION FROM STATIONARY SOURCES. *(Kotei nensho sochi oyobi nensho sosa no kaizen ni yoru chiso sankabutsu haishutsu yokusei ni kansuru kenkyu). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 9(6):311-343, 1975. 5 refs.*

A 40 ton/hr utility boiler was equipped with flue gas recirculation and two-stage combustion apparatus. At 10%-20% recirculation, nitrogen oxides concentrations were measured at 60% or 75% load for C heavy oil and 75% load for heavy and light and naphtha or petroleum gas at 3% oxygen concentration in flue gas. At 100-80% of theoretical air, NOx were measured at 100% or 75% load for C-oil, 100% load for heavy and light naphtha, and 75% load for petroleum gas. Nitric oxide and nitrogen dioxide were analyzed by the chemiluminescence method and potentiometry while particulates concentration was measured by the filter paper method. The NOx concentration increased in the order of light naphtha, petroleum gas, and C-oil, and it also increased with increasing load. Reductions of NOx by 20% flue gas recirculation ranged from 50% for petroleum gas to 10% for C-oil. The reduction by two-stage combustion ranged from 40-45% for petroleum gas to 30-35% for C-oil. A 43% NOx reduction was achieved for C-oil by the combination of the two techniques.

52243 **APTIC NO. 74791**

National Research Inst. for Pollution (Japan), and Resources Catalysts and Chemicals Ind. Co., Ltd. (Japan)

STUDIES ON OXIDATION CATALYSTS OF NO FROM FLUE GAS. *(Nensho haigasu chu no NO no sanka shokubai ni kansuru kenkyu). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(1):32-42, Jan. 1975.*

A gas mixture containing 500 ppm nitric oxide, 200 ppm sulfur dioxide and 4% oxygen was prepared by mixing a NO(5%)-nitrogen mixed gas, an O2(4%)-N2 mixed gas and a SO(1%)-N2 mixed gas. Steam was added to the mixture and the gas was introduced to a reacting tube which was heated by furnace. The reaction temperature was adjusted by a thermocouple on top of the catalyst bed. A portion of the resulting gas was passed through a cooling chamber to remove moisture followed by analysis with a chemiluminescence NO + NO2 analyzer. Another portion of the gas was passed through activated charcoal to remove SO2 and water followed by analysis for O2 content. A dry gas mixture containing no H2O and SO2 was also used for the study. The oxidation activity of metal oxides decreased in the order of cobalt, manganese, iron, and copper, while that of the binary system of the oxides(3:2 or 2:3) decreased with the order of Cu-Mn, Co-Cu, Co-Mn and Co-Fe. The optimum temperature was 250-350 C and the highest rate of conversion for cobalt oxide was 90% while that for Cu-Mn oxides was 80%. Effects of H2O, SO2 and alumina supporters were more significant at low temperature.

52244 **APTIC NO. 74901**

STUDIES ON AIR POLLUTION CONTROL; SULFUR OXIDES AND NITROGEN OXIDES. *(Taiki osen taisaku no kenkyu; iou sankabutsu oyobi chisso sankabutsu). Text* *in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 54(579):572, 1975. 22 refs.*

Emission control methods for sulfur oxides and nitrogen oxides are reviewed. The methods available are the reduction of sulfur and nitrogen contents in fuels, flue gas denitrification and desulfurization techniques, and improvement of combustion techniques for NOx control. Direct desulfurization techniques for heavy oil can reduce sulfur content in treated oil to 0.3%, while indirect desulfurization techniques can reduce it to 0.05 to 0.1%. Most of the techniques for flue gas desulfurization are the wet type rather than the dry type such as copper oxide absorption and activated carbon methods. The wet methods used are sodium sulfite-gypsum, lime-gypsum, and sulfuric acid methods for large scale emission sources; small to medium scale emission sources use absorption techniques with alkali solution in which the by-product is not recovered. Flue gas denitrification techniques include dry type and wet type methods. An example of the former method is a catalytic ammonia reduction, and examples of the latter include the oxidation reduction method, oxidation absorption method, and ozone oxidation method. The difficulty with the ammonia reduction method was that the catalyst showed low activity with the presence of moisture and sulfur dioxide in the flue gas. More than 90% denitrification efficiency could be obtained by most of the wet methods. The improvement of fuel combustion techniques for NOx control include two-stage combustion, exhaust gas recirculation, low air combustion, water atomized combustion, catalytic combustion, and a combination of these. From 20 to 40% of NOx formation during fuel combustion can be prevented by these methods.

52245 **APTIC NO. 74902**

COUNTERMEASURES FOR AUTO EXHAUST CONTAMINANTS. *(Jidosha haishutsu bushitsu taisaku). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 45(579):575, 1975. 61 refs.*

Automobile exhaust gas control is reviewed. The methods fit into three categories: the modification of present engines and combustion processes; purification of exhaust gas; and development of new engines. Lean combustion is used as one of the nitrogen oxides control methods, but it requires steady ignition as well as high energy of ignition spark. The removal of unburned hydrocarbon compounds is by catalysts, the activity, selectivity, and thermal stability of which are still problems so that a great deal of research on the development of catalysts has been necessary. Non-catalytic systems use exhaust gas recirculation. The rotary engine employs a thermal reactor, and engines with a fuel injection system use an oxidation catalyst. New engine designs to replace the present internal combustion engines in automobiles include gas turbines, Rankine cycle engines, electric engines, and hybrid engines. Most of these engines utilize a continuous external combustion system making the control of exhaust gas easy, but they have difficulties in the transfer and conversion of energy.

52246 **APTIC NO. 76690**

Argonne National Lab., Argonne, Ill.

HIGH-PERFORMANCE BATTERIES FOR OFF-PEAK ENERGY STORAGE AND ELECTRIC-VEHICLE PROPULSION (PROGRESS REPORT). *Energy Research and Development Administration Contract W-31-109-Eng-38, 135p., Jan. 1975. 59 refs.*

NTIS: ANL-8109

The development of high performance lithium/sulfur batteries for off-peak energy storage in electric utility networks and electric vehicle propulsion is described. Present state-of-the-art cells possess negative electrodes of solid lithium-aluminum alloy and positive electrodes of iron sulfide with an electrolyte of lithium chloride-potassium chloride eutectic (melting point of 352 C). The operating temperature of the cells is about 400-450 C. An engineering-scale (13 cm in diameter) Li-Al/FeS2 cell was operated for 2137 hr and 111 cycles and achieved a specific energy of 155 watt-hr/kg. (Author abstract modified)

1974

52247 **APTIC NO. 76662**

Arase, K. and T. Ueda

COUNTERMEASURES FOR THE REDUCTION OF NOX GENERATED BY INDUSTRIAL BOILERS. *(Jikahatsu sangyoyo boira NOx teigen taisaku to sono koka no jisseki ni tsuite). Text in Japanese. Anmonia to Kogyo (J. Ammonia Ind.), 27(4):19-29, 1974.*

The history, production and chemistry of nitrogen oxides are described. Countermeasures such as the use of non-nitrogen fuel, excess air, open dampers, waste gas recirculation, air temperature, burner angle, and boiler load are discussed. Effective control measures include: overfire air systems, large furnaces, gas recirculation and mixing systems, and low air temperature burning systems. Reorganization measures the will be taken are: the investigation of nitrogen oxide emissions trials of low NOx operations, the necessity of reconstruction, the selection of reconstruction plans, and the effects of reconstruction.

52248 **APTIC NO. 74420**

Austin, Robert R. and Arthur Leonard Vincent

GAS REMOVAL METHOD AND COMPOSITION. *(International Telephone and Telegraph Corp., New York) U. S. Pat. 3,833,508. 2p., Sept. 3, 1974. 3 refs. (Appl. Oct. 12, 1971, 5 claims).*

A selective method of removing sulfur dioxide from flue gases or the like containing both SO2 and hydrogen sulfide without removing the H2S by bubbling the flue gas through about a 5-95% solution of an organic acid and an alkali metal salt of the said acid is described. The acid is selected from the group of: citric, malic, lactic, succinic, ascorbic, and tartaric. The acid is preferably citric and the alkali metal is preferably potassium. The ratio of the weight of the salt to that of the acid may be within the range of about 1s:2a to 6s:1a or such as is needed to make the solution pH between about 4.0 and 6.0, where s and a are one mole of each of said salt and said acid, respectively. The said ratio preferably is 5s:1a or the pH is preferably 5.7. (Author abstract)

52249 **APTIC NO. 74308**

Brille, Maurice G.

ADOPTION OF BRILLE-TYPE AXIAL MOTOR FOR AUTOMOBILES. *(Le moteur a barillet Brille applique a l automobile). Text in French. Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 184-187, 1974. (Presented at the Congress International FISITA, 15th, Paris, France, May 13-17, 1974, Paper B-1-2.)*

The design and advantages of the Brille-type axial motor developed for automobiles are described. The engine, capable of operating on different fuels, such as regular or premium gasolines and methane, has been designed for optimal combustion, producing fuel economy and reduced unburnt hydrocarbon and carbon monoxide emissions. Optimal combustion conditions are achieved by automatic or manual adaptation of the compression ratio to actual load conditions and fuels (which is possible during driving), and by strictly uniform fuel distribution. A 5-cylinder model with a stroke volume of 2 liter is being built.

52250 **APTIC NO. 76722**

Chamrad, Jiri

DECREASING CUPOLA EMISSIONS. *(Snizovani exhalaci kuploven). Text in Czech. Slevarenstvi, 22(3 and 4):138-140, March-April 1974. 8 refs.*

The Clean Air Act of Czechoslovakia contains provisions for cupola emissions in the form of maximum allowable emission as a function of chimney height. Maximum short-term concentrations are 0.5 mg/cu m of dust and 6.0 mg/cu m of carbon monoxide. Maximum emission rates are 5.0 kg/hr of 20% silica dust and 60.0 kg/hr for CO. This data can be used to determine the required performance of antipollution equipment if the total amount of pollutants produced is obtained either from material balance calculations, statistical analysis of the amount of pollution as a function of cupola output, or by effective measurement of the pollution. Effective measurement of cupola pollution output is the only objective method for the determination of necessary control equipment. Various gravimetric methods can be used for this purpose. Results of emission measurements, as well as a survey of available equipment, indicate that the dust output of cupolas can be decreased to allowable levels only by high-efficiency separators with filtering. The only effective means for reducing the CO concentration seems to be additional combustion.

52251 **APTIC NO. 76658**

Chikaoka, S., T. Kawabe, and K. Miyagawa

POLLUTION CONTROLS FOR A UREA FACTORY - DEVELOPMENT OF A WASTE GAS TREATMENT APPARATUS FOR A GRANULATING TOWER. *(Nyoso kojo kogai taisaku - Zoryuto haiki shorisochi no kaihatsu). Text in Japanese. Anmonia to Kogyo (J. Ammonia Ind.), 27(4):8-12, 1974. 4 refs.*

The pollution of a urea factory produced by urea dust contained in the waste gas of granular urea production, and small amounts of urea and ammonia dissolved in a solution of aqueous urea. An apparatus for the recovery of urea dust in the waste gas of granulating towers, is described. A counterplan for waste gas produced in granulating towers, the development of a waste gas-treating apparatus, testing methods, the efficiency of the spray attachments and the filters the liquid-gas ratio and pressure loss, and industrial applications of the process are discussed.

52252 **APTIC NO. 74607**

Coon, C. W.

TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION: VOLUME IIB, SECTIONS 24 AND 25 AND APPENDIXES A THROUGH I (FINAL REPORT). *Dept. of Automotive Research, Southwest Research Inst., San Antonio, Tex., Dept. of Transportation Contract DOT-TSC-628 and Environmental Protection Agency, Work Unit OS514/R5523, Rept. DOT-TSC-OST-74-39.IIB, 176p., Dec. 1974. 144 refs.*

NTIS: PB 238-679

A preliminary survey of the technological feasibility of reducing the fuel consumption of automobiles was done. The design changes, which are recommended for the purpose of maximizing fuel economy, were derived after lengthy review against a series of constraints including regulatory requirements, technical feasibility, and cost effectiveness. Several possible technological improvements are identified, documented, and evaluated with respect to fuel economy. Results are reported as percentage improvements in fuel economy by comparison with 1973 model year vehicles. Exhaust emissions dependent upon operating variables and engine design were evaluated for spark ignition, turbocharged, diesel, and stratified charge engines. Automotive emission control systems such as positive crankcase ventilation, lean mixture operation, retarded spark, idle stop solenoid, choking, inlet air heating, recirculation, air and fuel injection, evaporative emission control, exhaust reactors, and fuel usage are described.

52253 **APTIC NO. 74948**

Finegold, Joseph G. and Wm. D. Van Vorst

HYDROGEN ENGINE TECHNOLOGY. *Preprint, Societe des Ingenieurs de l Autobobile, Paris (France), p. 293-298, 1974. 15 refs. (Presented at the Congres International FISITA 15th, Paris, France, May 13-17, 1974, Paper B-2-4.)*

The development of hydrogen-engine technology is traced from 1820 to the present with particular emphasis on methods employed to combat pre-ignition and backfire through the carburetor. The combustion properties of hydrogen are reviewed and compared with those of the more conventional fuels, such as gasoline, propane, and methane. The properties of hydrogen suggest changes in the design or operation of an engine to be fueled by hydrogen. The problem of pre-ignition is examined in detail, and induction time is suggested as a key to its solution. Intake charge dilution is proposed as the most satisfactory means of alleviating pre-ignition in conventional engines. The effects of intake charge dilution on the following are discussed: minimum ignition energy, highest useful compression ratio, combustion duration; combustion temperature, thermal efficiency, and nitric oxide emissions. Three intake mixtures are considered: hydrogen-air, hydrogen-air diluted with recycled exhaust gas, and hydrogen-air with intake-manifold water injection.

52254 **APTIC NO. 74451**

Furukawa, T., K. Suzuki, S. Masumoto, N. Masuda, and I. Eguchi

ATTEMPT AT REDUCTION OF NOX BY THERMAL GAS SELF CIRCULATORY BURNER. *(Netsu gasu jiko saijunkan shiki bana ni yoru NOx teigen no kokoromi). Text in Japanese. Preprint, Japan Combustion Assoc., Tokyo, 2p., 1974. 2 refs. (Presented at the Japan Combustion Association Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

Improvements in the combustion chamber of self-recycling type burner designed to make it a more efficient low nitrogen oxides burner are described. Nitric oxide generation was reduced from 57 ppm to 22-35 ppm. The reduction in NO was achieved by improved thermal diffusion in the combustion chamber and a lower flame temperature. Carbon particulates were also restricted effectively. Increased generation of NO due to preheating of air for combustion was lowered by using a steam spray. Nitric oxide generation was increasingly influenced by air infiltration into the furnace as the burner was operated at increasingly higher efficiencies.

52255 **APTIC NO. 74408**

Hofbauer, P.

UNCONVENTIONAL DRIVES FOR FUTURE AUTOMOBILES? *(Unkonventionelle Antriebe fuer zukuenftige Automobile)? Text in German. Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 233-243, 1974. 17 refs. (Presented at the Congr. International FISITA, 15th, Paris, France, May 13-17, 1974, Paper B-1-12.)*

Unconventional automobile power plants are studied by means of a matrix of all possible combustion processes and engine designs. Engines with cyclic and continuous internal combustion are retained for a detailed analysis as the most promising variants. A permutation of the characteristics of the spark ignition and diesel processes resulted in 14 hybrid variations; the spark ignition, stratified charge, and diesel engines are further analyzed with respect to their fuel economy and environmental features. Diesel engines, apart from offering considerable fuel economy relative to spark ignition engines, satisfy the proposed 1978 U. S. emission standards. However, abatement of the odor and soot emissions will require further improvements. Stratified charge engines with additional exhaust afterburning devices have reduced exhaust emissions. Rotary combustion engines, presently characterized by increased fuel consumption, will be of significance when methanol as a motor fuel is available on a large scale. Engines with continuous internal combustion are expected to have emissions below the 1980 standards.

52256 **APTIC NO. 74627**

Horvath, Laszlo and Jolan Rekettyey

AIR POLLUTION BY CUPOLAS AND THE POSSIBILITY OF REDUCING IT. *(Zanieczyszczenie powietrza przez zeliwiaki i mozliwosci jego amiejszenia). Text in Polish. Przeglad Odlewnictwa, 24(5):160- 166, 1974. 2 refs.*

A study of the quantity and physicochemical properties of dust escaping with cupola gases, as well as possible control techniques is reported. Several dry and wet dust control installations and the criteria for their selection are presented. The cupola dust contains coke particles, coke ashes, limestone, rust, sand, and oxides of iron, manganese, and silicon. The dust content varies, depending on the installation, time, content of carbon in the coke, combustion efficiency, melting capacity, and quantity of dry cupola gas. Textile filters and electrostatic dust control devices are described and illustrated. Dust control installations should be chosen according to grain size, dust concentration, particulate size, friction, corrosion, and gas quantity. Investment in dust control equipment is an insignificant part of the overall cost.

52257 **APTIC NO. 74509**

Hoshizawa, Kinji

STUDIES ON LOW-NOX COMBUSTION METHODS. *(Tei NOx nenshoho no kenkyu). Text in Japanese. Japan Assoc. for Thermal Energy Technology, 35p., 1974. 8 refs. (Presented at the Japanese- American Symposium on NOx Countermeasures for Stationary Sources, Tokyo, Japan, June 28-29, 1974.)*

The effects of nitrogen content in the fuel on nitrogen oxide formation during combustion are investigated using a small combustion test furnace. Measurements at an actual power plant using various control methods are also presented. Methods of NOx control via large-scale imporvements and methods not involving improvements are discussed. Mixtures of flue gas with combustion air, step combustion processes, combinations of flue gas mixture and step combustion, reducing the flow speed at the burner throat exit, and the use of low NOx burners are discussed. Methods not involving large-scale changes include: low oxygen combustion methods, improvement of air supply to the furnace, reducing the air preheating temperature, increasing the amount of gas recirculation, water injection, and decreasing the nitrogen content of the fuel. The most effective method is denitrification of fuel, but this method does not reduce thermal NOx. Therefore, when the N content in the fuel is high or thermal NOx must be decreased, combustion improvement methods must be applied. Measurements at a power plant indicate that the most effective method is the injection 30% water which decreases NOx emissions by 42%; combustion efficency, however, is reduced.

52258 **APTIC NO. 74782**

Hsu, Pan-tao and Hsi-hung Hsu

COMBUSTION OF SOOT EMISSION FROM DIESEL ENGINES. *(Dizeru enjin yoru haishutsu sareru susu no nensho). Text in Japanese. Preprint, Japan Society of Automotive Engineers, p. 299-302, 1974. 3 refs. (Presented at the Japan Society of Automotive Engineers, Lecture Meeting, Tokyo, Japan, Oct. 15-17, 1974, Paper 41.)*

Smoke from a diesel engine was introduced into a re-combustion burner consisting of a 38 mm by 1000 mm quartz tube, a 10 mm copper tube inserted into the quartz tube, an air compressor, and a preheater. City gas was introduced through the copper tube, and air was supplied into the quartz tube where the soot was burned. Sample gases were collected from four openings on the quartz tube, and the temperature was measured by inserting a thermocouple through the same openings. Analysis of the gas concentration at various locations showed that the gases were thoroughly mixed at about 20 cm from the smoke inlet. The soot concentrations decreased with increasing excess air ratio and reached a minimum at an excess air ratio of about 1.25. The effect of air preheating was most significant during the initial period. The time required for 90% soot conversion was reduced by 50% when gas heating temperature was increased from 1100 C to 1200 C.

52259 **APTIC NO. 74603**

Hurter, Donald A.

A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE CONSUMPTION; VOLUME II: COMPREHENSIVE DISCUSSION (FINAL REPORT). *(Little (Arthur D.), Inc., Acorn Park, Cambridge, Mass., U. S. Dept. of Transportation Contract DOT-TSC-627, Work Unit OS514/R5523, Rept. DOT-TSC-OST-74-40.11, 213p., Dec. 1974. 78 refs.*

NTIS: PB 238-694

A study was conducted to determine potential improvements in automobile fuel consumption based on innovative design and components. Standard and compact-size reference vehicles were selected, and a study of how power is used was conducted. Obvious technological innovations (e.g., power plants), transmissions and drive train systems, tires, accessories and and auxiliaries, aerodynamics and weight) that would save on fuel consumption were identified and evaluated, then screened against program constraints. Operation of reference vehicles equipped with innovative or redesigned components was computer- stimulated to predict fuel usage and performance. Techniques for measuring fuel economy performance were also developed and a statistical evaluation of published driving modes was performed. Compliance of innovative components with constraints and user requirements was determined. Optimized synthesized standard and compact-size vehicles were simulated and total systems evaluation of each vehicle was performed on the basis of fuel usage, performance, technical compatibility, compliance with constraints, user acceptability, and manufacturer adaptability. Synthesized vehicles were ranked in accordance with study objectives, and conclusions and recommendations on designs were made. (Author abstract)

52260 **APTIC NO. 74532**

Iinoya, Koichi, Kazutaka Makino, and Nobutoshi Tanaka

ON ECONOMICALLY OPTIMAL DESIGNING OF BAG FILTER. *(Baggu firuta no keizai saiteki sekkei ni tsuite). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 38(6):53-60, June 1974. 5 refs.*

The theoretical derivation for economically optimal design of bag filters is described. The economic equations were derived based on the fixed cost and running cost for bag filters, fixed cost and running cost for fan, and renewal cost of filter cloth. Assuming that the life time of filter cloth is dependent on the frequency of cleaning operation and the duration time of use, the optimal solutions for operating pressure drop, filtering velocity, and filter cloth cleaning cycle were determined. The effects of various parameters on optimal solutions and relative sensitivity were calculated. In the case of a low gas flow rate of 1 cu m/sec, the optimal operating condition is unaffected by the gas flow rate, and the total yearly cost is proportional to the 0.8th power of gas flow rate for small scale equipment and to the 0.9th power for large scale equipment. The optimal operating pressure drop and yearly cost per unit flow quantity of gas increase with the increase in dust concentration of gas, while the optimal gas filtering velocity decreases with the increase in dust concentration. The optimal operating conditions are greatly affected by the pressure drop characteristic equation and residue fraction of dust load after cleaning.

52261 **APTIC NO. 74335**

Inaba, H.

FLUE GAS DENITRIFICATION METHOD OF HITACHI SHIPBUILDING AND ENGINEERING CO. *(Hitachi zosen-shiki haien dassho-ho). Text in Japanese. Sekiyu Gakkai-Shi (J. Japan Petroleum Inst.) (Tokyo), 17(6):512-515, June 1974.*

Flue gas denitrification methods including non-selective, semi-selective, and selective reduction processes are described. The non-selective reduction method uses A- and B-type catalysts with carbon monoxide, hydrogen, or methane as the reducing agent. The semi-selective reduction method uses a B-type

catalyst with CO, H_2 or CH_4 as the reducing agent; while the selective reduction method uses a D-type catalyst with ammonia as the reducing agent. The non-selective method requires prior desulfurization of sulfur dioxide to below 10 ppm, whereas the semi-selective and selective methods do not. Pilot plant results indicate the nitrogen oxides and SO_2 are reduced from 150-200 ppm and 250-350 ppm to 1-5 ppm and 1-2 ppm, respectively, by non-selective reduction; NOx are reduced from 150 ppm to less than 10 ppm by selective reduction.

52262 APTIC NO. 74304

Juentgen, H.

PREPARATION OF GASEOUS ENERGY CARRIERS FROM FOSSIL FUELS. ***(Herstellung gasfoermiger Energietraeger aus fossilen Brennstoffen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 224:13-23, 1974. 18 refs.***

The state of the art of the gasification of solid energy carriers, especially by the use of nuclear energy, is presented. Carbon reacts with water vapor at temperatures over 600 C to form carbon monoxide and hydrogen in an endothermal reaction. A further reaction with water varpor in the presence of catalysts at temperatures around 400 C yields more hydrogen and carbon dioxide. The synthesis gas can also be converted into methanol under pressures of 50 or 200 at at temperatures of 350 or 450 C. The methanol obtained can be used as an automobile fuel. Synthesis gas can be converted into methane catalytically at 400 C and under 40-70 at pressure. Synthetic natural gas can also be obtained by direct conversion of coal with hydrogen at temperatures above 600 C and pressures above 50 atm. New developments in the USA attempt to combine a water gas reaction with the direct methane conversion reaction. Authothermal conversion can be achieved by reacting water vapor and hydrogen simultaneously with coal or coke. The use of nuclear reactor heat increases the overall efficiency of the gasification process, and economized fossil energy carriers. Conversion into synthesis gas, hydrogen, city gas, and methanol is more economical than that into methane. Nuclear-energy makes oxygen generation unnecessary, and permits the use of high-efficiency fluidized-bed converters. The helium outlet temperature of such nuclear reactors shall not be lower than 950 C. Gasification of coal by means of water vapor in a fluidized-bed reactor passed through by the hot helium and hydrogenating gasification of coal involving gasification of part of the coal with water vapor and hydrogen and hydrogen generation from methane with nuclear heat and water vapor are being studied in West Germany.

52263 APTIC NO. 74300

Kato, Masuo and Atsushi Yorioka

DEODORIZATION PLANT PROJECTION BY OZONE. ***(Ozon ni yoru dasshu puranto no keikaku). Text in Japanese. Kogyo Yosui (Ind. Water), no. 194:42-45, Nov. 1974.***

The use of ozone for waste water treatment is better than the use of chlorine or activated carbon, since ozone has both deodorization and sterilization effects and its oxidizing power is strong. Rapid waste water treatment can be made by ozone and moreover, no reaction residue is produced. The necessary amount of ozone is determined by a threshold odor-reaction time curve to adjust the threshold odor units between 7 to 10. The plant consists of an air cleaner, and ozone generator, and a reaction bath. Dust and moisture is air are removed at the air cleaner, and the purified air is introduced into a glass silent discharge tube at which ozone is generated under 10,000 to 20,000 V. The generated ozone is bubbled through waste water and 90% of the odorous components in the waste water can be decomposed within 10 min. If a preliminary activated carbon treatment is made, the required reaction time is much shorter. When more than the necessary ozone is bubbled through the waste water, treatment of ozone at the outlet of the reaction bath is necessary. Ozone can be treated by either heat decomposition at 400 C or activated carbon adsorption, but the latter method is less costly.

52264 APTIC NO. 74449

Kawauchi, Kaoru

NOX ATTENUATION MEASURES FOR MEDIUM AND SMALL SIZE BOILERS. ***(Chusho boira no NOx teigen taisaku). Text in Japanese. Boira Gishi (Boilermen), 29(2):15-24, 1974 (?).***

Boilers using A heavy oil and kerosene as fuels and the Daido R-100 burner were studied for their efficiency in nitrogen oxides prevention. The capacities of the boilers ranged from 60,000 to 4,000,000 kcal/hr. The specific burner was so designed that parts of the combustion gas were introduced back to the fuel-spraying chamber by a ring nozzle, by which fuel was decomposed by high temperature combustion gas, and the decomposed gas was further burned with incoming air. The advantages of the burner were low temperature combustion, control of excess air, and extensive promotion of combustion. With the Yoshimine NHD-1200 boiler, which has a heat transfer area of 19.3 sq m, furnace volume of 1.68 cu m, and evaporation capacity of 1000 kg/hr, the NOx concentration was 75 to 85 ppm and 67 to 73 ppm when A heavy oil and kerosene were used as fuels, respectively. The NOx concentration was reduced 40 to 58%.

52265 APTIC NO. 74375

Khristianovich, S. A., V. M. Maslennikov, Y. A. Vyskubenko, M. I. Derbaremdiker, M. K. Pis men, and P. M. Sharov

PROTECTION OF THE ENVIRONMENT AGAINST THE POLLUTANT EMISSIONS FROM THERMAL POWER PLANTS BY IN-CYCLE GASIFICATION OF HIGH-SULFUR HEAVY OILS. ***(Zashchita atmosfery ot vrednykh vybrosov teplovykh elektrostantsiy metodom vnutritsiklovoy gazifikatsii vysokosernistykh mazutov). Text in Russian. Teploenergetika, no. 11:52-55, 1974. 7 refs.***

A method for the gasification of high-sulfur heavy oils for use in thermal power plants and its effect on air pollutant emissions are described. The high-sulfur heavy oil is gasified under pressure at a temperature around 1300 C by partial combustion (the admission of air at a rate accounting for 40-45% of the theoretically necessary volume for complete combustion). The gas thus obtained is composed of hydrogen, carbon monoxide, and nitrogen, as well as of soot and ashes. The gas is cooled by means of heat exchangers, and the heat thus recovered is used for power generation. Soot and ashes are then separated by scrubbing with water. Soot is separated from ashes and returned for gasification or for the extraction of vanadium and other elements. The sulfur compounds are separated by absorption in amine or other substances. The concentrated hydrogen sulfide obtained by regeneration is converted into elemental sulfur or sulfuric acid. The reduction of the combustion temperature as compared with conventional furnace temperatures also results in a substantial abatement of nitrogen oxide emissions. The economy of the gasification process increases with increasing gasification pressure.

52266 APTIC NO. 74443

Kitagawa, Mutsuo and Katsumi Hayashi

ODOR PREVENTION FOR DYE FACTORIES. ***(Senshoku kojo ni okeru akushu boshi ni tsuite). Text in Japanese. Kako Gijutsu (Pap. Converting), 9(7):49-53, 1974. 6 refs.***

The treatment methods for controlling toxic and malodorous substances emitted from degumming, bleaching, dyeing, and finishing processes are described. Treatment by physical methods such as dilution, adsorption, masking, and cooling-condensation methods and chemical methods such as absorption, combustion, oxidative decomposition, and neutralization are described with the theoretical base, advantages and disadvantages. The general procedures of the absorption method and absorption process consisting of water, alkali, and acid towers, the adsorption method using activated charcoal, silica gel, zeolite and activated clay, the combustion method at 700 C or catalytic combustion at 280-340 C in the presence of

platinum, vanadium or other metallic catalysts, and oxidative decomposition with ozone are discussed.

52267 **APTIC NO. 74944**

Koizumi, M., T. Tanaka, and Y. Ishihara

WET PROCESS FOR NITROGEN OXIDES REMOVAL FROM FLUE GAS. (PART 1): ADDITIVES FOR ACCELERATING THE REACTION RATE OF NITROGEN OXIDES REMOVAL WITH SODIUM SULFITE SOLUTION. *(Haien dassho shisshiki kangen ho (Dai-1-po): Aryusan natoriumu suiyoeki ni yoru chisso sankabutsu jokyo hanno sokushinyo tenkazai no kento). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind. Rept.), no. 74021:1-11, Aug. 1974. 5 refs.*

The reaction rate of sodium sulfite with nitrogen oxides is too slow to be a good method of denitrification. In order to find a catalyst for the reaction, about 60 types of organic and inorganic additives and 40 types of surfactants were tested using a foam tower type small experimental absorption apparatus. Organic and inorganic ferrous salts were found to be effective for accelerating the absorption reaction of NOx by aqueous sodium sulfite solution. The removal rate of NOx by Na2SO3 solution was 15%, while it was increased to above 98% by the addition of ferrous salt, chelating agent, and surfactant. The problem of ferrous salt precipitation at a pH above 6.0 was solved by adding chelating agent producing a water soluble ferrous complex. The removal rate of NOx was somewhat increased by the addition of chelating agent. The removal rate by ferric salts was about 20% less than that of ferrous solution. This was improved, however, by adding a chelating agent. The addition of 2-20 ppm of surfactant greatly improved the denitrification rate.

52268 **APTIC NO. 74319**

Krasowizkij, Jurij and Klara Krasowizkaja

THERMAL SEPARATION OF HETEROGENEOUS GAS SYSTEMS BY FILTRATION WITH GRAINED MATERIAL. *(Thermische Trennung von heterogenen Gassystemen durch Filtration mit koernigem Material). Text in German. Preprint, Technische Hochschule Woronesh, Sektion Verfahrenstechnik, Woronesh (USSR), 5p., 1974. 2 refs. (Presented at the Process Engineering Annual Conference, Dresden, German Democratic Republic, 1974.)*

The thermal separation of particulate matter from heterogeneous gas systems by filtration with grained material is studied under laboratory conditions over a wide temperature range. An adequate mathematical modeling relating the efficiency andd pressure difference of the filter with the physicochemical parameters of the heterogeneous system is proposed. The influence of thermophoresis on the amount of the particles passing through the filter is evaluated. Cylindrical filters are more advantageous than planar ones.

52269 **APTIC NO. 76728**

Kurose, M.

CONTROL EQUIPMENT FOR AIR POLLUTION. *(Kuki osen seigyo setsubi). Text in Japanese. Seifutii Daijesto (Safety Digest), 20(8):304-318, Aug. 1974.*

Total and partial ventilation systems and waste gas treatment apparatus are discussed. The control equipment contains mechanisms for the discharge of contaminated air, and the introduction of clean air into working areas. In the case of working areas contaminated with low concentrations of toxic gases, contaminated air is diluted by clean air and the discharge of diluted air lower than the control value of the working space. Partially contaminated air near the generating source is removed by a suction apparatus at as high a concentration as possible and discharged into the atmosphere after purification. By the introduction of highly purified air into a room, the quantity (concentration) of contaminated water (where if required), temperature, humidity and pressure are controlled. Many kinds of dust-removing apparatus are also described.

52270 **APTIC NO. 74432**

Lazarre, Flavien, Jacques Rozand, Gilbert Blu, and Jean-Pierre Bimond

FLARE INSTALLATION FOR THE COMBUSTION OF HYDROCARBON GAS WITH PRIOR ADMIXING OF AIR. *(Societe Nationale des Petroles d Aquitaine, Paris (France)) U. S. Pat. 3,833,335. 4p., Sept. 3, 1974. 3 refs. (Appl. Aug. 3, 1973, 3 claims).*

An improved flare installation to burn excess hydrocarbon gas, comprising a mixing chamber receiving atmospheric air and having an inlet of gases from a low-pressure separator, and an injector for gas from a high-pressure separator, on the same axis as a mixer, while a burner is provided below this chamber. The improved device is specially suitable for the non-polluting burning of gases accompanying liquid hydrocarbons in production fields, during testing, or in refinery plants. (Author abstract)

52271 **APTIC NO. 74628**

Maftei, S.

REDUCTION OF THE SULFUR DIOXIDE CONTENT IN EMISSIONS FROM STATIONARY SOURCES. *(Reducerea concentratiei SO2 in gazele emanate de surse stationare). Text in Romanian. Stud. Cercet. Chim. Tom., 22(5):611-644, 1974. 132 refs.*

The desulfuration of emissions from stationary sources by three major methods is discussed. The methods are based on adsorption, absorption, and retaining the pollutant in the gaseous state. The methods based on adsorption use impregnated or non-impregnated activated coal with wet or dry regeneration. They also include adsorption on aluminum, carbonates, or alkaline oxides (dry and mixed dry-wet procedures). Adsorption on alkaline dicarbonates, metal oxides, and fibers is also discussed. The methods based on absorption include absorption in water, alkaline suspensions (suspensions of calcium oxide and dolomite and suspensions of magnesium oxide), suspensions of metal oxides and salts (oxides of magnesium and manganese, manganese, copper, oxides of iron, and ferric sulfate), oxidizing solutions, solutions of sulfur salts, sodium hydroxide, organic substances, and alkaline melts. Methods of retaining pollutants in the gaseous state include catalytic oxidation and treatment with gaseous reagents. All of the methods and procedures are described and illustrated in detail. Cost estimates are also provided. The methods and costs discussed refer to 1972 and 1973. In 1980 the cost for the industrial control of sulfur dioxide will reach approximately $8,000,000,000.

52272 **APTIC NO. 74554**

Masukawa, Shigehiko

CLEAN ENERGY AND CLOSED SYSTEMS. *(Kurin enerugi to kurozudo sisutemu). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(9):20-26, Sept. 1974.*

The various aspects of energy problems are discussed focusing on the economic merits and social demerits of littoral heavy chemical industrial conglomerates. The recent oil crisis created by the Middle East War only proved the extent of oil dependency of other industrial countries. Plans for converting to other energy sources are discussed. These include the use of natural gas and atomic energy (thermal reactor) in place of oil, coal for steel mills and solar energy for heating and cooling by 1990, the use of petrified fuel and hydrogen along with other energy sources after 1970 forming a complex energy structure, and the use of nuclear fusion reactors and new types of hydrogen and methanol economies after 2050. The present status and feasibility of the proposed plans are examined. Industrial reorganization by the introduction of closed systems and recycling of materials is discussed from the viewpoint of environmental protection.

52273 **APTIC NO. 74556**

Mori, Akira

THE HITACHI STACK GAS DESULFURIZATION SYSTEM. *(Hitachi haien datsuryu sochi ni tsuite). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(8):40-48, Aug. 1974.*

The general description of DESOX series desulfurization system developed by Hitachi Co. is given. Three desulfurization systems producing gypsum as a side product, the activated charcoal method, limestone-gypsum method, and soda-gypsum method, are introduced. In the activated charcoal method, the sulfur dioxide adsorbed onto activated charcoal is oxidized to sulfur trioxide by the oxygen present and reacts with water producing sulfuric acid. The desulfurization system by the activated charcoal method consisting of adsorption process, desorption process, and treatment processes for H2SO4 by concentration or production of gypsum is described with flow sheets. The procedure is simple and the desulfurization efficiency is excellent even at low SO2 concentration. In the limestone-gypsum method using limestone as absorbent, the SO2 is removed as calcium sulfite produced by the reaction with calcium carbonate. The desulfurization efficiency is over 95%. In the soda-gypsum method using reactive sodium hydroxide solution as absorbent, the SO2 and SO3 are converted to sodium sulfite and sodium sulfate which are then reacted with calcium hydroxide producing CaSO3 and CaSO4.

52274 **APTIC NO. 74434**

Nakai, Shigetake and Manoru Kurosawa

ON DESULFURIZING TREATMENT OF EXHAUST GAS IN DYEING FACTORIES. *(Senshoku kojo ni okeru haien datsuryu shori ni tsuite). Text in Japanese. Senshoku Kogyo (Dyeing Ind.), 22(3):142-139, March 1974. 2 refs.*

Major processes of exhaust gas desulfurization are reviewed. They include the lime and gypsum method, sulfurous ammonium, Wellman Lord method, and exhaust gas desulfurization by active carbon. Wet desulfurization should be adopted in dyeing works from which alkali exhaust water is discharged since exhaust gas desulfurization and neutralization of alkali solution can be conducted at the same time by utilizing the alkali exhaust water. The Toyobo Vortex Reactor, developed by Toyobo Co., Ltd. is designed for desulfurization of small and medium boiler emissions. The air solution contact methods conducted in wet desulfurization are classified into three types: absorbing solution dispersed in gas; gas dispersed in absorbing solution; and a combination of these two methods. The Toyobo Vortex Reactor is an absorbing apparatus in which the first and second types are rationally arranged. The absorbing solution is contaminated after sulfur oxides and dust have been eliminated by means of air solution contact. It shows a high chemical oxygen demand value and also contains dust (the chief component of which is carbon as suspended solid). For that reason it is desirable that absorbing solution be discharged as a clarified solution of low COD value by establishing an oxidation process or SS separating process.

52275 **APTIC NO. 74348**

Nakata

THE WORLD S LARGEST FUEL AND HEAVY OIL COMBUSTION 1000 MW ULTRA CRITICAL PRESSURE BOILER. *(Jugenyu nensho sekai saidai 1000 MW cho-rinkaiatsu boira). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 11(4):158-161, 1974.*

An ultra critical pressure, combined circulation boiler with a total output of 1000 MW and an evaporation capacity of 3180 tons/hr is described. The main features of the boiler include a fuel economizer, air preheaters, gas recirculation blowers, low and high pressure oil pumps, and pressure injection type burners. The boiler employs tangential fire ring burners, two-stage combustion, andd combustion gas recirculation techniques for nitrogen oxide reduction. The tangential fire ring burners provide homogeneous and stable flames that substantially reduce NOx emissions.

52276 **APTIC NO. 76731**

Oblaender, Kurt, Joerg Abthoff, and Axel Berndt Nagel

STATUS REPORT ON SPARK-IGNITION ENGINE EXHAUST CONTROL. *(Stand der Abgasreinigung von Otto-Motoren). Text in German. Erdoel Kohle (Hamburg), 27(10):610-615, Oct. 1974. 6 refs.*

The state of the art of design modifications and exhaust emission control for spark-ignition engines is discussed. The air-excess coefficient has no optimum for all exhaust components. Stratified charge, providing a rich mixture near the spark, yields no satisfactory solution to the emission problem. Hydrocarbon and nitrogen oxides emissions can be reduced by delayed ignition. Reduction of the compression ratio has a similar effect. The nitrogen oxide emissions can be reduced most efficiently by water injection and exhaust recirculation. The admission of secondary air to the exhaust gas is insufficient by itself; and thermal reactors with temperatures above 700-800 C, requiring lean mixtures, are used in conjunction with secondary air. Thermal reactors can also be operated without secondary air. The new emission standards in the United States require oxidizing catalysts for carbon monoxide and hydrocarbons and reducing catalysts for oxides of nitrogen. Certain catalysts combine oxidation and reduction reactions in a well-defined oxygen concentration range. The noble-metal catalysts platinum and palladium require the use of lead-free gasoline.

52277 **APTIC NO. 74441**

Oda, Ryohei

THE NITROGEN OXIDES POLLUTION CONTROL LAW AND ITS RELATIONSHIP TO DYE AND DYEING. *(Chisso sankabutsu kogai boshiho to senryo senshoku to no kankei). Text in Japanese. Kako Gijutsu (Pap. Converting), 9(7):46-48, 1974.*

As a control measure for nitrogen oxides pollution, the deoxidation method for organic compounds was explored. Deoxidation by reduction using hydrogen is excluded. Some of the known oxidation reactions are deoxidation of nitro and nitrile compounds with phosphites, isocyanate preparation from aromatic NO2 compounds by deoxidation with carbon monoxide, deoxidation of aromatic aldehydes and ketones in the presence of tungsten hexachloride and butyllithium, and deoxidation of nitrobenzene to azoxybenzene and nitrosobenzene to azobenzene in the presence of Fe(II) salene (Floriani s method). The preparation of azo dyes by single-step deoxidation coupling may be possible. If such a process of deoxidation coupling can be realized, a pollutionless dyeing process without using water may be developed. The deoxidation of NO compounds with CO proceeds readily in the presence of tin or copper oxides. This reaction might be useful for isocyanate preparation from aromatic NO2, compounds and preparation of azo dyes.

52278 **APTIC NO. 74558**

Okuda, Satoru

CORROSION OF POLLUTION CONTROL EQUIPMENT AND COUNTERMEASURES APPLICATION OF ANTI-CORROSIVE FRP. *(Kogai boshi sochi no fushoku to taisaku - taishoku FRP no oyo -). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 38(3):27-29, March 1974.*

The most applied fiber reinforced plastic (FRP) is the bisphenol system followed by the isophthalic acid system and vinyl ester system. Examples showed that FRP used as the material for flue gas desulfurization apparatus resisted corrosion to a considerable degree. Apparatus with 10 mm thick FRP or a 2.5 mm lining of FRP can serve with a 3-5% alkaline solution used as absorbent and flue gas having a composition of 300-600 ppm sulfur oxides, 30 ppm hydrogen sulfite, 16 vol% carbon dioxide, 30 vol% moisture, and 3-4 vol% oxygen.

The FRP lining material used in a bag filter for the treatment of flue gas containing 65 ppm SOx, 4.75 ppm hydrogen chloride, 4 ppm organic acids and 0.52 ppm nitrogen oxides at 100 to 120 C was excellent in preventing corrosion. Fans with FRP are highly anti-corrosive toward various air pollutants, lighter in weight compared to metals, have no requirement of painting, high specific strength, and are able to absorb noise generated from rotating. Other pollution control apparatus employing FRP include packing tower gas absorbing apparatus, and venturi scrubbers as well as their accessories such as hoods and ducts.

52279 **APTIC NO. 76724**

Olajec, Fladimir

REDUCING EMISSION OF AIR POLLUTANTS IN THE ALUMINA MANUFACTURING PROCESS. *(Obmedzovanie uniku exhalatov pri virobe hlinika). Text in Czech. Ochrana Ovzdusi, 6(5):60-65, May 1974. 2 refs.*

Problems involving the control of air pollutant emissions from an alumina plant are discussed. Dust concentrations in raw material dumping, storage, and crushing areas are decreased by judicious location of exhausts, wet dust separators for bauxite and limestone, and by delivery of raw materials during the warm season. Preparation of the charge and sintering processes generate mainly gaseous pollutants. Carbon dioxide is reused in the carbonization process. Dust is removed by wet scrubbing which is almost 100% effective. The sintered mixture is cooled by the same air that is used to remove the dust from crushers and which also serves as secondary combustion air in sintering ovens. Reconstruction of several separators and the use of a three-step separation process has brought the dust level in the sinter grinding facility down to a tolerable level. Diffusion and carbonization are wet processes and do not present any pollution problems. Alumina is obtained from the powdered hydrate by thermal processing in calcination ovens. It is extracted by a three-stage precision separator and delivered pneumatically to storage silos. The problem of dust removal from the air used in this pneumatic system and the problem of dust control in storage silos have not been solved adequately due to lack of funds.

52280 **APTIC NO. 74526**

Ono, Isao, Shinpei Hara, and Hiroyuki Miya

ENVIRONMENTAL PROTECTION MEASURES FOR PLASMA CUTTING. *(Purazuma setsudan ni okeru kankyo taisaku). Text in Japanese. Yosetsu Gijutsu (Weld. Tech.), 22(6):27-29, June 1974. 1 ref.*

Environmental protection measures for plasma cutting of steel plates are presented. The pollution from plasma cutting include gases (nitric oxide, nitrogen dioxide, ozone, and carbon monoxide), fumes of fine metallic particles, ultraviolet ray damage, and noise. Protection from ultraviolet rays is effected by using protective glasses and a translucent plastic shield. Noise levels seem not to be excessive, so no countermeasures have been taken as yet. Disposal of noxious gases is effected by newly-developed equipment (patent applied for). The gases are taken out below the fixed cutting plate by means of a duct on which rows of intake tubes are mounted perpendicular to the duct, parallel to the cutting plate. The tubes have slits through which the noxious gases and dust residues are pulled into the main duct, and purified by being conducted through a Rotocron. An S-shaped centrifugal set-up in this machine mixes the exhaust material with water. The water takes out the dust, and gases are released into the atmosphere through a chimney.

52281 **APTIC NO. 74301**

Robinson, F. J.

TROCHIODAL EXPANDERS FOR AUTOMOTIVE RANKINE SYSTEMS. *J. Automotive Eng., 1974:16-19, Dec. 1974. 15 refs.*

The use of trochoidal expanders for automotive Rankine systems is discussed. Trochoidal expanders may be operated at low speeds and in either direction, providing the starting torque characteristics are associated with positive displacement machines and minimizing transmission requirements. Since all rotating elements of such machines turn about their respective centers of gravity, these machines are inherently balanced. Multi-lobed configurations are possible, which provides for very smooth turning moment characteristics and makes them suitable for cross compounding. By use of separate inlet and exhaust ports, the uniflow principle is achieved more closely in this type of expander, with minimal recompression. Expansion ratios of about 20:1 are practicable with the configurations illustrated, and higher ratios may be achieved by compounding a number of stages. Fully condensing Rankine systems are essential to achieve acceptable efficiencies for the automotive application, and the resulting system elements present packaging problems in current car designs. The compact design of trochoidal expanders compares favorably with the currently proposed reciprocating designs. (Author conclusions modified)

52282 **APTIC NO. 74999**

Roth, J.

THE POSSIBILITIES OF ELIMINATING THE LEAD EMISSIONS BY AUTOMOTIVE VEHICLES. *(Les possibilites de limitation des emissions de plomb par les vehicules automobiles). Text in French. Rev. Inst. Franc. Petrole, 29(2):267-282, March-April 1974.*

A trapping device developed by Texaco and Octel, which controls lead emissions, is discussed. It consists of 2 filters mounted in series. The filters are made of stainless steel yarn covered with aluminum and placed in a steel casing. They consist of a cartridge and an air tight casing. The collecting filters are wrapped in glass fibers. The cylinders thus formed are blocked at the ends by the glass fiber. Steel bands at both ends secure airtightness. A hole is made at one extremity to allow gas flow. The extremities of the cylinder are locked between 2 plaques linked by threaded stems. The emission particles are collected into the 2 filters during the test. The device has been tested for OCTEL by UTAC on 2 Renault 12 vehicles, one equipped with the device, and the other without it. The device appears to favor the retention of lead in the fuels and, at the same time, reduces exhaust emissions. It has undergone a 31,000 km endurance test at UTAC. The results reveal an efficiency gain of 60%, while the noise and the pollution parameters, such as carbon monoxide and hydrocarbons, remain the same. Nevertheless, the device decreases the quantity of lead emitted by approximately 65%, i.e., 2.9 to 1. After 31,000 km, the device has decreased the lead quantity by 60%, i.e., 2.5 to 1.

52283 **APTIC NO. 74534**

Sasaki, Tatsuji

LNG THERMAL POWER PLANT AND OPERATION RECORDS. *(LNG karyoku hatsuden setsubi to unten zisseki). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(8):1-18, Aug. 1974.*

The Minamiyokohama thermal plant with total 1150 MW output power (three generators built during the period of 1967-1970) was designed to operate solely with the liquefied natural gas (LNG) in the amount of 1,180,000 tons/yr. The LNG from Alaska and other areas consisting of lower methane series hydrocarbons ($C_nH_{2n + 2}$) contains no sulfur components and produces no dust particulates upon combustion. It is an ideal fuel from the viewpoint of environmental protection. The liquefaction procedure for natural gas, manner of transportation, composition of LNG, physical constants of each LNG component and combustion characteristics are described. The operational procedures, facilities, and equipment from the unloading of LNG to the final combustion foor power generation are described with flow diagrams, and the equipment specifications are also given. The evaluation of performance, safety factors and operational records indicated the satisfactory achievement of the development plan.

52284 **APTIC NO. 74336**

Sato, I.

DEVELOPMENT OF FLUE GAS DESULFURIZATION PROCESS (DIL H2SO4 - GYPSUM METHOD) - CHIYODA THOROUGHBRED 101 PROCESS. *(Haien datsuryu purosesu (kiryusan - sekko-ho) no kaihatsu - chiyoda sarabureddo 101 haien datsuryu purosesu). Text in Japanese. Sekiyu Gakkai-Shi (J. Japan Petroleum Inst.) (Tokyo), 17(9):732- 735, Sept. 1974. 7 refs.*

The Chiyoda Thoroughbred 101 Process for flue gas desulfurization is described. Flue gas is cooled to 50-80 C and is supplied to the bottom of an absorption tower to which 2-3% dilutedd sulfuric acid is introduced. Sulfur dioxide is absorbed and the resulting gas is released. The absorbed SO2 is oxidized by oxygen with the aid of an iron catalyst, and part of the resulting sulfuric acid is removed. The remaining sulfuric acid is allowed to react with limestone to form gypsum. At an SO2 concentration of 1000 ppm and a liquid/gas ratio of 60 l/normal cu m, the rate of desulfurization is as high as 95%. The iron catalyst is not poisoned by many organic and inorganic compounds at various concentrations, whereas manganese catalysts are strongly poisoned by sodium nitrate at 30 ppm and vanadium pentoxide at 100 ppm. The process is being utilized at six plants treating flue gas ranging from 14,070 normal cu m/hr to 100,000 normal cu m/hr. The rate of desulfurization ranges from 91% to 97.5%.

52285 **APTIC NO. 74856**

Sato, Takeshi, Gen Fujimoto, and Takao Kodaira

STUDIES ON DEVELOPING A BINARY FLOW CIRCULATION SWIRL JET INJECTION VALVE AND THE PERFORMANCE OF GASOLINE ENGINES UTILIZING IT. *(Niryutai kanryushiki uzumaki funshaben no kaihatsu to sore o oyo shita gasorin kikan no seino ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 379-384, 1974. 6 refs. (Presented at the Japan Society of Automotive Engineers Lecture Meeting, Tokyo, Japan, Oct. 15-17, 1974, Paper 51.)*

A binary flow circulation swirl jet injection valve was used in place of the carburetor on a gasoline engine, and continuous injection was carried out. The injection valve was designed according to the following specifications: fuel supply range 0 to 20 cc/sec, fuel supply pressure under 5 atmospheres, air supply pressure under 2 atmospheres, and outside diameter of the valve equal to 20 mm. Fuel introduced into the swirl chamber formed a conical, hollow film at its exit. The flow rate of fuel was controlled by adjusting the valve in the circulation chamber which was located on top of the swirl chamber. The fuel spray angle was adjusted by an inside air stream which passed through the center of the fuel film and by an outside air stream which surrounded the film. The fuel particle size decreased with an increasing inside air stream. The outside air stream had no effect on the particle size. The fuel spray angle was arbitrarily adjusted by varying the inside and outside air streams. The distribution of the flow rate was greatly affected by the shape of the inside air exit. At an air-fuel ratio of 18 or more, the operation of the engine was stable, although a slight decrease in torque and an increase in exhaust gas temperature were observed.

52286 **APTIC NO. 74600**

Shidara, Masao

SELECTION OF INDUSTRIAL FUELS WITH DUE CONSIDERATION TO AIR POLLUTION PREVENTION. *(Kogai taisakumen kara mita enerugi tenkan no shinden to mondaiten). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(1):69-76, 1974. 11 refs.*

Fuel conversion to meet recently enacted environmental standards for sulfur oxides (SOx) and nitrogen oxides (NOx) is discussed. To reduce SOx emissions, exhaust emission desulfurization is necessary, but fuel conversion is the simplest countermeasure, by such means as increased importation of low-sulfur petroleum (Indonesian, Russian); desulfurization of high-sulfur petroleum before use as fuel; utilization of crude oil rather than heavy oil as fuel; and the use of naphtha, LNG (liquefied natural gas), and NGL (natural gas liquid). Emission controls for NOx from industrial facilities impose emission concentrations of 130-480 ppm for new facilities under construction, and 170-600 ppm, to be attained by July 1975 or 1976, facilities now in operation. Conversion to gaseous fuel should be considered. Solid fuels (coal) have a nitrogen content of 0.7-1.6%. Petroleum fuels (liquid) have a nitrogen content of 0.1-0.4%. Atmospheric sulfur standards, to be reached in 5 yr, are as follows: hourly values must be below 0.1 ppm; and average daily values must be below 0.04 ppm 98% of the time. When the daily average values exceed environmental standards for more than two consecutive days, the 98% rule does not apply. Present standards for nitrogen oxides are based on nitrogen dioxide (NO2). In 5-8 hr, average daily NO2 values, calculated from hourly values, must be below 0.02 ppm 98% of the time. The average yearly value should be below 0.01 ppm; hourly values should be below 0.06 ppm (to be attained as soon as possible.

52287 **APTIC NO. 74431**

Stahfeld, Donald L.

PROCESS FOR REDUCING THE ARSENIC CONTENT OF GASEOUS HYDROCARBON STREAMS BY THE USE OF SELECTIVE ACTIVATED CARBON. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,833,498. 7p., Sept. 3, 1974. 11 refs. (Appl. July 18, 1973, 10 claims).*

A process for reducing the arsenic content of a gaseous hydrocarbon stream by contacting the stream with a sorbent comprising a specially defined metals content activated carbon prepared from a bituminous coal. The charge stock for treatment in accordance with the invention is gaseous hydrocarbon feedstream wherein the hydrocarbons preferably have from one to four carbon atoms per molecule and which feedstream contains arsenic as an impurity in an amount from about 20 ppb to about 20 ppm or more. Particulary preferred for treatment by the process of this invention are those light unsaturated hydrocarbon gases obtained by the catalytic cracking of heavier petroleum hydrocarbons such as gas oils or the thermal cracking of propane streams to produce ethylene-ethane streams. The removal of arsenic by this process is probably accomplished, at least in part, by chemisorption.

52288 **APTIC NO. 76676**

Suto, J., O. Szabo, M. Czencz, and I. Szebenyi

INVESTIGATION OF SOME FACTORS INFLUENCING AIR POLLUTION BY DIESEL ENGINE EMISSION. *(Vyskum niektorych cinitelov ovplyvnujucich znecistovanie vzduchu emisiami z naftovych motorov). Text in Slovak. Ropa Uhlie, 16(7):385-390, July 1974. 7 refs.*

Factors affecting diesel engine exhaust emissions were investigated. Measurements of the smoke point of a reference fuel (82.9% n-alkanes, 17.1% i-alkanes) and fuels containing 10, 20, 30, 40, or 60% aromatic hydrocarbons and 5.0% sulfur compounds were made. For concentrations higher than 10%, the smoke point was dependent only on the aromatic hydrocarbons, but no definite relationship was established. Five different commercial diesel fuels were analyzed and tested for toxic components and soot in the exhaust. Heavier fuels yielded larger soot particles. The total amount of polycyclic aromatic compounds was independent of singular carcinogenic activity. The addition of a smoke suppressant to a low viscosity fuel resulted in a 50% reduction in soot and an increase of about 50% in the total amount of polycyclic hydrocarbons.

52289 **APTIC NO. 74349**

Tamaoki, A.

PRESENT AND FUTURE OF HEAVY OIL DESULFURIZATION EQUIPMENT. *(Juyu datsuryu sochi no genjo to sono tenbo). Text in Japanese. Sekiyu Gakkai-Shi (J. Japan Petroleum Inst.), 17(11):917-921, Nov. 1974.*

A fluidized bed process for the hydrodesulfurization of fuel oil is described. Crude oil and hydrogen are supplied from the bottom of thee reactor packed with a catalyst. New catalyst is supplied from the top while used catalyst is removed from the oottom of the reactor. The treated oil is led to a high-temperature, high- pressure chamber for separation. Treatment of Kuwait residue oil containing 3.8 wt% sulfur with an L catalyst forr the reduction of the S content to 1.0 wt% at 410 C at a space velocity of 0.88/hr by the process results in a 40% metal content for the used catalyst as compared to a 10% metal content for used catalysts in conventional fixed bed processes. The catalyst consumption is considerably reduced by using a combination of two or three reactors.

52290 **APTIC NO. 74423**

Tanada, Seiki

STUDIES ON THE ADSORPTION REMOVAL OF METHYL MERCAPTAN GAS. *(Merchiru merukaputan gas no kyuchaku jokyo ni kansuru kenkyu). Text in Japanese. Shikoku Koshueisei Gakkai Zashi (J. Shikoku Soc. Public Health), 19(2):57-75, Nov. 1974. 37 refs.*

Adsorption removal of methyl mercaptan gas was examined with 28 kinds of adsorbents. Active carbon No. 4-C (prepared from active carbon No. 4 by treatment with 1% NaOH solution) showed the largest amount of adsorption of methyl mercaptan gas. The amount of methyl mercaptan gas adsorbed on the active carbon and zeolite treated with 1% NaOH solution was more than that adsorbed on the non-treated active carbon and zeolite. Adsorption of methyl mercaptan gas was a physical adsorption, as indicated by the heats of adsorption (less than 10 kcal/mole). The adsorption efficiency (amount of methyl mercaptan gas adsorbed by the dynamic method vs. that measured by the static method) of active carbon was always better than that of the silicate and zeolite. The concentration of methyl mercaptan gas remaining in the model room was measured by the circulation method. The initial concentration of 2.0 ppm off methyl mercaptan gas was reduced to 0.002 ppm after 30 min using the No. 4-C adsorbent.

52291 **APTIC NO. 74293**

Teraoka, Tsuneyuki

CHIYODA THOROUGHBRED 101 TYPE APPARATUS OF HOKURIKU DENRYOKU, CHIYODA KAKO. *(Hokuriku Denryoku no Chiyoda Sarabureddo 101, Chiyoda Kako, ni tsuite). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochem.), 18(12):71-74, Dec. 1974.*

At the Fuji Shinko Power Station the desulfurization plant is the Chiyoda Thoroughbred 101 process. The process uses dilute sulfuric acid to absorb sulfur dioxide gas, and the sulfurous acid produced is air oxidized with iron catalyst to sulfuric acid. The by-product of the process is calcium sulfate gypsum which is prepared by reaction of sulfuric acid with lime slurry. The water content of the product is 10 to 15 wt% after centrifugal separation, and the productivity is 70 tons/day. The maximum amount of flue gas treatable is 750,000 N cu m/hr, and desulfurization efficiency is better than 86%. The single absorption-oxidation tower has a double structure, and SO2 absorption is carried out at the outer portion of the tower while oxidation takes place at the inner portion of the tower. A special stainless steel is used as the plant material to prevent corrosion by sulfuric acid.

52292 **APTIC NO. 74698**

Tsukahara, M. and M. Murayama

STUDY ON REDUCTION OF NOX FROM WASTE GAS OF DIESEL ENGINE - REDUCTION OF NOX BY PILOT JET PROCESS. *(Diizerukikan ni okeru NOx teigen ni kansuru kenkyu - Pairotto funsha ni yoru NOx no teigen). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 17-20, 1974. (Presented at the Japan Society of Mechanical Engineers, Hokkaido Branch Lecture Meeting, 17th, Hokkaido, Japan, Oct. 2, 1974.)*

Experiments were conducted with jet diesel engines to observe the effects of the fire up-time of the main jet and pilot jet and the jet quantity of the pilot jet on heat generation and yield of NOx. By selection of the fire up-time and jet quantity of the main jet and pilot jet, it was possible to reduce most of the NOx from jet engine waste gas without a decrease in engine capacities (such as engine power and fuel consumption rate).

52293 **APTIC NO. 74859**

Tsuruga, Takahiro, Nobuo Iwai, Shinji Kobayashi, and Hideo Sudo

STUDIES ON A METHANOL ENGINE FOR AUTOMOBILES - THE EFFECTS OF CARBURETION IN THE AIR SUCTION PIPE. *(Jidoshayo metanoru kikan no kenkyu - kyukikannai de no kika no eikyo). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 367-372, 1974. 3 refs. (Presented at the Japan Society of Automotive Engineers, Lecture Meeting, Tokyo, Japan, Oct. 15-17, 1974, Paper 49.)*

The effects of mixed gas temperature and fuel vaporization rate on engine characteristics, exhaust composition, and loss of cooling water were studied. A four-cycle, single cylinder engine was used for the study, and water-methanol (0-100%, 10-90%, 20-80%, 30-70%, 40-60%, 60-40%) and gasoline were used as fuels. At a low mixed gas temperature, the vaporization rate decreased, particularly at high water concentrations. Heat efficiency decreased at high water concentrations. Maximum burning time (MBT) was reached earlier, particularly in the case of gasoline. Hydrocarbons in the exhaust gas comprised mostly unburned methanol. Nitrogen oxide levels in the exhaust were decreased. At a low vaporization rate, unburned fuel increased significantly; heat efficiency was reduced, and loss of cooling water became very significant. An increasing output with decreasing water concentration in fuel and a higher output when gas inlet tube was not heated were also observed. At the same heating temperature, gasoline gave a higher output than methanol.

52294 **APTIC NO. 74951**

Watson, H. C., E. E. Milkins and J. V. Deslandes

EFFICIENCY AND EMISSIONS OF A HYDROGEN OR METHANE FUELED SPARK-IGNITION ENGINE. *Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 215-223, 1974. 21 refs. (Presented at the Congres International FISITA 15th, Paris, France, May 13-17, 1974, Paper B-1-9.)*

The use of hydrogen and methane as fuels for a conventional sprak-ignition engine is described. The prime object of the investigation was to establish the optimum operating conditions for minimum emissions, and maximum fuel economy and power output over the normal speed ratio encountered in automobile power plants. A high-speed (Cylinder Fuel Research) CFR engine was specially adapted to permit admission of gaseous fuels and precautions were taken to reduce explosion hazards. A special valve was necessary for operation with hydrogen. This valve timed the injection of hydrogen into the inlet port in order to avoid residual-gas ignition at high exhaust temperatures. Nitrogen oxides emissions were higher with hydrogen and methane than with gasoline at the same air-fuel ratio. By increasing air-fuel ratios, NOx emissions car be reduced and some power loss restored by increasing compression ratios. The working point selected for hydrogen or methane fueled engine operation will be determined by the trade-off between emissions, fuel economy, and power-weight ratio.

52295 **APTIC NO. 74315**

Yamamichi, Yoshikazu and Junichi Nagao

BASIC SULFATE ALUMINUM-GYPSUM METHOD DEVELOPED BY DOWA MINING CO., LTD. *(Dowashiki enkisei ryusan arumu sekko-ho). Text in Japanese. Sekko to Sekkai (Gypsum Lime), 130(5):125-129, May 1974.*

An absorption process for removing sulfur dioxide from gas streams is described. The method utilizes a basic sulfate aluminum water solution to absorb the sulfur dioxide. This water solution is produced by neutralizing a part of the sulfate with limestone which is added to the sulfate aluminum water solution. The method consists of an absorbing process, an oxidation process, a neutralization process, and a gypsum filtration process. A packed tower is used as the absorbing tower. Scaling is not observed during long-term operations. Absorption efficiency is more than 90% when the operation is conducted with a liquid to gas ratio of five to one, an exhaust gas temperature of 100 C, and an SO2 content of 0.75%.

52296 **APTIC NO. 74316**

Mitsubishi Chemical Industries (Japan) Div. of Carbons

ENVIRONMENTAL PROTECTION MEASURES FOR COKE FACTORIES. *(Kokusu kojo no kankyo taisaku). Text in Japanese. Nihon Kokusu Kyokai-shi (J. Jap. Coke Assoc.), no. 9:1-10, 1974.*

Anti-pollution measures for coke factories are outlined. Present Japanese standards are listed for pollutant concentrations in air, water, and seawater. Desulfurization of coke oven gas is effected by the Diamox method which uses the ammonia present in the gas to absorb the hydrogen sulfide. The hydrogen sulfide gas is recovered through treatment in a deacidification column, and high purity liquid sulfur (99.9%) is obtained after the hydrogen sulfide and other acidic gases are passed through a Claus type sulfur recovery unit. Waste gases are purified by means of a Dekatox system (direct incineration and catalytic incineration) to eliminate malodors.

52297 **APTIC NO. 74447**

GOVERNMENT S ALLOCATION OF IMPORTANT TECHNOLOGICAL DEVELOPMENT SUBSIDIES FOR NOX CONTROL TECHNIQUES. *(Juyo gijutsu hojokin no kofu ukeru NOx gijutsu taisaku). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(9):56-58, Sept. 1974.*

The government allocated funds for seven private companies to develop denitrogenation techniques. Flue gas denitrogenation by ammonia reduction was for boilers using heavy oil as fuel, aiming at the establishments of control system and apparatus characteristics. A pilot plant with a capacity of 5000 N cu m/hr was built for denitrogenation of flue gas from a sintering furnace to study catalyst life. Mitsubishi Metal Co. developed a desulfurization-denitrogenation process using potassium permanganate as absorbent with the characteristics of no secondary pollutants and high efficiency. Kureha Chemical Co. also developed a desulfurization-denitrogenation process using sodium acetate solution as absorbent, by which sulfur dioxide was absorbed to form sodium sulfite which in turn absorbed nitrogen oxides. This method can be employed in boilers using high sulfur oil as fuel. A joint development by Ebara Manufacturing Co. and Atomic Power Research Inst. sucessfully applied an electron beam to convert SOx and NOx gases into aerosols which were then collected by electrostatic precipitator. Other methods developed include absorption by alkaline solution for gases from a small glass-smelting furnace, adsorption by silica-alumina type compounds, and adsorption by magnesium hydroxide.

52298 **APTIC NO. 74957**

BULLETIN OF THE OSAKA MUNICIPAL TECHNICAL RESEARCH INSTITUTE. *(Osaka Shiritsu Kogyo kenkyusho Hokoku). Text in Japanese. Osaka Shiritsu Kogyo Kenkyusho Hokoku (Bull. Osaka Munic. Tech. Res. Inst.), vol. 50:1-117, 1974.*

An ion exchange resin for gas adsorption is described. Adsorption filters were prepared from 20 g polystyrene-sulfonic acid-I(PSTSA-I, sulfonic acid content 4.1 m eq/g), 20 g polyvinyl alcohol (PVA), and 400 g water at 120 C for 4 hr; 20 g PSTSA-II(sulfonic acid content 5.7 m eq/g), 20 g PVA, and 400 g water at 120 C for 4 hr; 15 g polyacrylic acid (PAA), 15 g PVA, and 385 g water at 110 C for 4 hr; 5 g PSTSA-II, 10 g PAA, 15 g PVA, and 390 g water at 120 C for 3 hr; and 20 g activated carbon, 20 g PVA, and 400 g water. Filters 1, 2 and 4 had ammonia, trimethylamine and pyridine adsorption capacities of 61, 74 and 212 ml/g, 85, 103 and 300 ml/g, and 85, 101 and 290 ml/g, respectively. Filters 3 and 5 had ammonia and trimethylamine adsorption capacities of 99 and 125 ml/g and 21 and 39 ml/g, respectively. The breakthrough adsorption capacities of various ion exchangers on acetic acid vapor ranged from 3.72 m eq/g for Amberlite IRA-400 to 31.4 m eq/g for Bukorit-65. Bukorit-17 had a sulfur dioxide adsorption capacity of nearly 30 ml/g. The breakthrough adsorption capacities on benzylmercaptan ranged from 0.01 m eq/g for Amberlite IRA-400 to 4.35 m eq/g for Bukorit-65.

52299 **APTIC NO. 76659**

AIR-COOLING OF SCHOOLHOUSES PROGRESSES WITH NOISE POLLUTION CONTROL MEASURES. *(Kogai taisaku to tomoni susumu gakko kosha no reiboka). Text in Japanese. Reito to Kucho (Refrig. Air-Cond.), no. 166:8-11 Sept. 1974.*

Japanese school rooms are not usually equipped with air cooling or air conditioning systems. Much progress has been made in the area of air cooling and noise pollution reduction in certain areas. Many schools, such as the one at the U. S. Air Force Base at Yokota, airports, such as Haneda airport, and highways such as Tomei Kosoku, are planning to install air cooling or air conditioning equipment and noise pollution controls.

1973

52300 **APTIC NO. 76718**

Bazika, V.

DIESEL FUEL QUALITY AND EMISSIONS FROM DIESEL ENGINES. *(Kvalita motorove nafty a exhalace z naftovych motoru). Text in Czech. Ropa Uhlie, 15(5):265-275, May 1973. 9 refs.*

The effect of fuel quality on the exhaust of a nine cylinder, air-cooled, four-storage diesel engine was tested. The fuels tested were PL-4 aviation oil, ordinary diesel fuel, and Paramo fractionalized fuel. Neither the octane rating nor the degree of refining had any significant effect on smoke intensity. An increase in fuel density however, increased the intensity of smoke. Fuel additives such as Drew XPD 3-12-4, Petrolad 1.10, and Perolin Fuel Oil Treatment 661-ND were tested. They were used in doses recommended by their manufacturers. None of the additives resulted in any appreciable reduction in smoke intensity. The sensitivity of different engines to fuel additives varied.

52301 **APTIC NO. 74621**

Del Zotto, Giorgio

ELECTRONIC AUTOMATIC ADVANCE FOR AUTOMOBILE INTERNAL COMBUSTION ENGINES. *(Anticipo automatico elettronico per motori a scoppio d automobile). Text in Italian. Autom. Strum., 21(6):300-303, June 1973.*

An electronic automatic advance circuit that controls engine combustion and thus reduces automobile exhaust emissions is described. The electronic advance consists of a long tension convertor which is a device that at every movement of the piston through the point of maximum advance furnishes tension proportional to the value of the time period. The device, under the value of such tension, defines an impulse of duration. The tension of capacity heads is mathematically related to the current from the proportionate generator and the time. In both laboratory and road experiments the circuit was easily integrated into an automobile. The combination is easily controllable by means of an electronic feedback system.

52302 **APTIC NO. 76708**

Edgar, W. D. and J. M. Muller

THE STATUS OF COKE OVEN POLLUTION CONTROL. *Ironmaking Proc., AIME, no. 32:76-84, 1973. 11 refs.*

Pollution controls for coke oven emissions are reviewed. Charging smoke is presently controlled by any of the following three methods: external collection and gas cleaning from the larry car or standpipes (via scrubbers or incinerators), collection of gases in the collecting main system, and pipeline charging. Reductions in pushing emissions are often accomplished by major oven repairs, reduced coal volumes, or slower coking rates. Exhaust ducts are also used to collect rising emissions during the push. Venturi scrubbers can be used to clean the collected push emissions. Properly maintained baffles can be used to remove most of the entrained particulate matter in coke quenching emissions. Quenching vapors can be collected and passed through a mist suppressor before discharging from a stack. Continuous emissions can be reduced by proper maintenance involving adequate sealing at critical locations.

52303 **APTIC NO. 76700**

Hetrick, S. S. and F. J. Hills

FUEL LEAD AND SULFUR EFFECTS ON AGING OF EXHAUST EMISSION CONTROL CATALYSTS. *Preprint, Society of Automotive Engineers, Inc., New York, 31p., 1973. 16 refs. (Presented at the Society of Automotive Engineers Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730596.)*

The effects of fuel lead and sulfur on the aging of oxidation catalysts for the control of hydrocarbon and carbon monoxide emissions was investigated. Catalysts consisting of noble and base metals on pelleted and monolithic supports were aged for 12,000 mi in engine dynamometer operation using a multi-tube converter. The engine was operated on the same base fuel containing different amounts of trace lead (0.003-0.075 g/gal) and sulfur (0.004-0.10 wt%). The catalysts were aged at two temperatures, 1000 and 1350 F and with two lubricants, with and without metallic additives. The loss of CO and propylene conversion with aging was not significantly affected by differences in the fuel lead and sulfur contents for noble metal monolithic and pelleted catalysts. The ability of aged catalysts to convert propane, a hydrocarbon more difficult to oxidize than propylene, was degraded by higher fuel lead content at trace levels. Significantly smaller amounts of lead were accumulated on catalysts when they were aged at the lower temperature. Thus, exhaust system configuration and operating temperature may appreciably alter the relationships between fuel contaminant concentrations and the degree of contamination of aged catalysts. (Author abstract modified)

52304 **APTIC NO. 76711**

Kitasaka, Muneo

MITSUBISHI SMOKELESS OPERATION TECHNOLOGY. *Ironmaking Proc., AIME, no. 32:96-108, 1973.*

Smokeless coal charging and coke pushing operations developed by Mitsubishi Chemical Industries Ltd. of Tokyo are described. Smokeless charging is accomplished by using a gas liquor as a medium to trigger the ejecting effect in combination with a larry car equipped with a dust collector. About 80% of the coke oven gas and fine coal dust which are emitted during the course of charging are collected forcibly by means of the ejector, using as a motivating medium the gas liquor which is produced during the carbonization of coke in the oven. The remaining 20% is collected by a conventional dust collector. The smokeless coke pushing operation consists of the following elements: a hood covering the quenching car, suction ducts installed along the coke ovens, a wet dust scrubber installed close to the coke ovens, piping connecting the ducts and the dust collector, a suction fan, a stack, and auxiliary equipment.

52305 **APTIC NO. 74835**

Mimura, Muramatsu, Shimanaka, and Yamashita

MITSUBISHI DESULFURIZATION PROCESS OF FLUE GAS. *(Mitsubishi haien datsuryu sochi). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 10(5):252-254, 1973.*

Seven different flue gas desulfurization facilities (both wet and dry methods) developed by Mitsubishi Heavy Industries are summarized in tables according to absorbing method, absorber, by-product, and general characteristics. The specific desulfurization process for each facility is also summarized. Absorbers employed in these facilities include calcium carbonate, limestone, potassium hydroxide, and ammonia. Each facility is capable of reducing the sulfur oxide flue gas level to below most emission standards. The amount of flue gas treatable with these facilities ranges from 0.2 to 100 normal cu m/hr.

52306 **APTIC NO. 74783**

Miyabe, Hideya, Hideo Fukuda, Masao Shidara, Fumio Matsubara, Yukichi Hasuo, and Kenichiro Omata

STUDIES ON IMPROVEMENTS IN AUTOMOBILE EXHAUST CONTROL AND SAFETY. *(Jidosha no haki taisaku to anzensei kojo no kenkyu). Text in Japanese. Meiji Daigaku Kagaku Gijutsu Kenkyusho Nenpo (Ann. Rep. Inst. Sci. Technol., Meiji Univ.), no. 15:22-23, 1973. 3 refs.*

Studies on copper-nickel catalyst for use in automobile catalytic converters and on safety measures for high-speed collisions are reported. Copper-nickel compound catalyst in whisker form shows activity comparable to platinum catalyst in conversion of nitrogen oxides in automobile exhausts. Accordingly, Cu-Ni whiskers were pressed down into a flat board, 2 mm thick, and pelletized. Pellets (3-5 layers) were packed in a catalytic converter and sandwiched between layers of SUS 27 web. In laboratory tests with single cylinder engines, more than 90% of NOx conversion occurred (air-fuel ratio, about 13; space velocity, 4 times 10,000; temperature, 600-650 C). When any of the three factors was increased, conversion rates were decreased. It seems necessary to keep Cu-Ni catalyst in whisker form to obtain optimum activity. Energy absorption and diffusion experiments were conducted for automobile collisions with stationary objects. Wave-type guard fences, bumpers with hexagonal cross-sections, and pipe-ring structures, have been studied. Plastic deformation characteristics have been favorable.

52307 **APTIC NO. 74596**

Mooi, J., J. P. Kuebrich, M. F. L. Johnson, and F. J. Chloupek

MODES OF DEACTIVATION OF EXHAUST PURIFICATION CATALYSTS. *Preprint, Atlantic Richfield Co., Harvey, Ill., Harvey Technical Center, 22p., Feb. 27, 1973.*

Thermal and chemical mechanisms that contribute to the deactivation of platinum-containing automotive emission control catalysts were investigated. Physical and chemical tests were suitable to determine the mode of deactivation of platinum/ceramic monolithic exhaust purification catalysts. Poisoning and thermal deactivation were observed in a series of 10 catalysts, and deactivation was quantitatively related to the lead and phosphorus content of the catalyst and to the catalyst surface area. At temperatures above the normal operating range, lead interacted with the ceramic and occupied a nonpoisoning position. If a substantial amount of lead was incorporated in the ceramic, the melting point of the catalyst was reduced, and the catalyst became more susceptible to catastrophic degradation during high temperature mishaps. Thermal deactivation resulted when catalyst temperatures reach 2300 F or more, i.e., 600 to 1000 F above normal operating temperatures. Temperature excursions of this magnitude resulted from pulses of fuel-rich mixtures and were so short in duration that they were undetected by thermocouples in the exit gas stream. This deactivation mechanism involved a severe loss in pore volume and surface area. The platinum metal appeared to be affected very little by the high temperature. (Author conclusions modified)

52308 **APTIC NO. 76702**

Su, E. C. and E. E. Weaver

STUDY OF THE DEACTIVATION OF BASE METAL OXIDE OXIDATION CATALYST FOR VEHICLE EMISSION CONTROL. *Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1973. 17 refs. (Presented at the Society of Automotive Engineers Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730594.)*

The deactivation of a pelletized base metal oxide oxidation catalyst was evaluated in an eight-car fleet for up to 18,000 mi of customer-type driving. The fleet test was conducted to determine the effects of two converter locations and four tetraethyl lead levels (0.06-3.17 g/gal) in the fuel on the effectiveness of the catalyst for the control of carbon monoxide and hydrocarbon emissions. The amount of lead deposits found on the catalyst represented about 50% of the lead in the fuel based on an assumed gas mileage of 17 mpg and was nearly in direct proportion to the lead content of the fuel and independent of converter location. The catalyst activity for CO and HC oxidation was adversely affected by the accumulation of lead deposits. The major effect due to converter location was a loss in the catalyst effective surface area. Catalyst samples from front-mounted converters suffered a greater loss of surface area than those from rear mounted systems. However, a nearly twofold variation in catalyst surface area (50 versus 100 sq m/g) exerted a relatively small effect on the HC oxidation activity. (Author abstract modified)

52309 **APTIC NO. 74713**

Takeuchi, Shigeo, Tamotsu Shima, and T. Mori

ON REMOVAL OF ODOR COMPONENTS IN LIQUEFIED PETROLEUM GAS BY ACTIVATED CARBON METHOD. *(Kasseitan ho ni yoru LP gasu shuki seibun no jokyo ni tsuite). Text in Japanese. Nagano Kogyo Shikenjo Gyomu Hokokusho (Tech. Rept. Nagano Prefect. Ind. Res. Inst.), vol. 1973:46, 1973.*

The activated carbon removal technique for odor compounds in liquefied petroleum gas by activated carbon was studied using gas chromatography with flame photometry and a tricresyl phosphate column. Twenty-three compounds were detected from LPG including methyl mercaptan, ethyl mercaptan, dimethyl sulfide, tetrabutyl mercaptan, and ethyl sulfide. The LPG was purified by an activated carbon column. No organic sulfur compounds were detected from the column effluent, and column saturation of 1 kg carbon was detected by GC after 17,139 l of LPG were treated. The human nose could not detect any odor for this effluent. Using the same apparatus, the waste liquid of LPG was purified and organic sulfur compounds were also adsorbed by the activated carbon. Saturation of the carbon column was observed after 40 l waste liquid was treated by a 400 g activated carbon column.

52310 **APTIC NO. 76685**

Vejvoda, Josef

INVESTIGATION OF BASIC CONDITIONS FOR DESULFURIZATION OF FLUE GAS BY ADDITION OF LIMESTONE TO A SKODA 4 TON/HR, OIL-FIRED STEAM GENERATOR. *(Vyzkum zakladnich podminek odsirovani spalin pri davkovani vapence do olejoveho kotle Skoda 40 t pary/h). Text in Czech. Ochrana Ovzdusi, 5(8):121-126, Aug. 1973. 11 refs.*

Operating conditions for flue gas desulfurization via limestone addition to an oil-fired steam generator are presented. The limestone was fed at a level where the temperature of flue-gas was sufficiently low so that the limestone would not overburn and the resulting calcinate would have a maximum reaction with sulfur dioxide. A total of 19 tests were performed using two different types of fuel and two different types of limestone. Limestone was fed above, between, and below the burners at an optimum angle of 17 deg, where the temperature was 30-1030 C and calcination was 60-80%. A stoichiometric analysis of calcium indicated a multiple of 1.5-2.0 for the limestone surplus. Physical and chemical properties of the calcinate were also investigated. A desulfurization of flue-gas by 40-50% was possible by using the dry limestone process in this particular plant. Extension of the process to other plant types requires the creation of a mathematical model of the process.

1972

52311 **APTIC NO. 74945**

Hoshizawa, K., T. Sema, K. Koyata, and T. Yatabe

CONTROL TECHNIQUE FOR NITROGEN OXIDES BY MIXING FLUE GAS AND COMBUSTION AIR. *(Juyu nenshoji ni okeru nensho yo kuki-haigasu kongo hoho ni yoru chiso sankabutsu no gensho). Text in Japanese. Denryoku Chuo Kenkyusho Gijutso Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind. Rept.), no. 72026:1-25, Sept. 1972. 10 refs.*

The method of mixing flue gas with combustion air using a single burner test furnace (flow rate of heavy oil, 50l/hr) was investigated as a method of nitrogen oxides control. The method of mixing flue gas with secondary combustion air rather than total combustion air was more effective as a NOx control measure. The particulate concentration was reduced at a flue gas-air ratio when the oxygen concentration was about 1%. However, when the O2 concentration was 3% and 0.5%, the particulate concentration increased with an increase in the mixing ratio. When the O2 concentration was 1%, the reduction rate of the particulate concentration was 37% with a flue gas ratio of 15% when added to the secondary air, and 37% with a flue gas ratio of 10% when added to the total combustion air. The flame temperature decreased in the first case (60 C decrease at 32%), and increased in the second case (20 C decrease at 15%). The NOx concentration decreased with the increase in the flue gas ratio. The optimum conditions for reducing NOx without increasing the particulate concentration are as follows: at a 32% flue gas ratio, the NOx concentration is reduced by 20% in the case of adding to the secondary combustion air (O2 equals 1%); the NOx is reduced by 10% at a 15% flue gas ratio when adding to the total air (O2 equals 1%).

52312 **APTIC NO. 76680**

Kulich, Jozef

THE FURNACE DUSTS OF BANSKA BYSTRICA CEMENT WORKS AS A POTASSIUM AND CALCIUM FERTILIZER. *(Pecne prachy z cementarne Banska Bystrica ako draselno-vapenate hnojivo). Text in Slovak. Polnohospodarstvo, 18(1):55-62, Jan. 1972. 13 refs.*

The furnace dust from a cement works was tested against six potassium and calcium fertilizers on an unfertilized soil sample, using horse bean as the test plant. The pH factor was optimized by the dust in an acid soil. The growth retardation was insignificant and similar to that of other fertilizers. Relative transpiration was reduced. The weight of the above-ground portion of the plant was increased to a value obtained with other potassium fertilizers. Furnace dust with a guaranteed content of potassium oxide and calcium oxide has the same properties as other potassium and calcium fertilizers.

1971

52313 **APTIC NO. 74613**

Descolas

AIR POLLUTION PREVENTION. DUST SEPARATORS. *(La prevention de la pollution atmospherique. Les depoussiereurs). Text in French. Centre de Formation et de Documentation sur les Nuisances, Paris (France), Rept. 6-71, 38, 11p., March 26, 1971.*

General problems of dust emission control and the general principles and uses of dust separators are described. The maximum allowable dust concentration in the waste gases of cement works and large capacity waste incinerators is limited to 150 mg/N cu m. Dust separators utilize the filte effect, inertia, or diffusion for the retention of dust. In porous filters, the filter permeability is an exponential function of the thickness of the filter layer. In air filtration, high-efficiency dust separation is possible, especially by means of cellulose filters. Industrial dust separation is based on the action of centrifugal, electrostatic, and hydrostatic effects. Recent developments in dust separation techniques indicate a trend toward high- efficiency electrostatic and layer filters at the expense of wet type dust separators with high pressure losses.

52314 **APTIC NO. 76674**

Fielding, G. H., H. F. Bogardus, R. C. Clark, and J. K. Thompson

ELECTRICALLY AUGMENTED FILTRATION OF AEROSOLS. *Preprint, Naval Research Lab., Washington, D. C., 14p., 1971 (?). 14 refs.*

Electrically augmented aerosol filtration via dielectrophoresis was investigated. The filter media were reinforced, nonwoven glass fiber mats (6.4 mm thick), and the filter electrode assembly was mounted between round-to-square transitions in the center of a cylindrical duct (10 cm in diameter by 250 cm in length). The effect of the applied electric field in enhancing filtration efficiency was calculated in terms of a dielectrophoretic augmentation factor which equalled the ratio of the percent of aerosol penetration at zero voltage to the penetration at some given voltage. Dielectrophoretic augmentation factors as high as 1100 were achieved at an air velocity of 3 cm/sec and a filter voltage of 7 kilovolts for 1.0 micron particles passing through HP-100 filter media. A DAF of 330 was achieved under the same conditions for 0.3 micron particles.

52315 **APTIC NO. 74546**

Karino, S.

EXHAUST GAS CLEANING APPARATUS BY WATER. *(Suisenshiki Haiki Senjosochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-8819. 2p., April 8, 1975. (Appl. March 19, 1971, 1 claim).*

A waste gas cleaning apparatus using water spray is described. The device consists of double umbrella-shaped plates and a water spray jet located in the space between them. The waste gas passes between the umbrellas and is sprayed with water. Installation of this device in the stack of a cupola or any small-scale factory is recommended. Addition of sodium hydroxide or calcium hydroxide to the water is necessary for efficient trapping of sulfates or chlorides in the waste gas.

1968

52316 **APTIC NO. 74618**

Guillermic, A. F.

THE FLUE GAS CIRCUIT IN FUEL OIL PLANTS. *(Le circuit des fumees dans les installations alimentees au fuel-oil). Text in French. Centre de Information des Combustibles liquides, Brussels (Belgium), C. R. Journ. Etud. CEDICOL, Bruxelles, Belgique, 1968, p. 94, 99-117, 1968. 6 refs. (Oct. 29.)*

Calculations of stacks and furnace-stack connections for fuel oil-fired combustion equipment are presented. The drop in the ambient temperature manifested a reduction in the rate of flue gas discharge; a considerable increase in draft which leads to increased air excess also necessitates the use of draft control. Stacks should be calculated with respect to the calorific power of the combustion installation, the possible stack height, the external depression, the nature of the stack wall surface, the weight and volume of the flue gases to be discharged, and the ambient conditions. The air excess in fuel oil-fired combustion equipment should be reduced as much as possible and as emission standards permit by the separate or joint use of burner control and combustion catalysts to increase the efficiency of the combustion equipment. Draft control is recommended for all combustion equipment, and especially so for units operating at small air-excess coefficient.

1965

52317 **APTIC NO. 74644**

Shvets, M. N., A. N. Zhilinskiy, and A. G. Genshaft

DEDUSTING OF ORE-DRESSING PLANT-GENERATED WASTE GASES IN TWO-STEP GAS CLEANING FACILITIES. *(Obespylivanie aglogazov v dvukhstupenchatykh gazoochistkakh). Text in Russian. Metallurg., no. 2:14-16, Feb. 1975.*

A two-step dust separator installed in an ore-dressing plant is described. The coarse dust fractions are first separated in dust bunkers into which the raw gas is admitted from the vacuum chamber. The gas is then admitted into dry cyclones. Final dust separation is achieved during a second step using low-pressure venturies with a centrifugal scrubber for droplet separation. The scrubbers and venturies are lined with heat-resistant and acid-proof ceramic material for protection against wear and corrosion.

MEASUREMENT METHODS

1975

52318 **APTIC NO. 74760**

Amatani, Kazuo

WIDE RANGE MONITORING SYSTEM OF ATMOSPHERIC POLLUTION. CONTINUOUS MONITORING BY INHABITANTS. *(Taiki osen koiki kanshi shisutemu ni tsuite. Jumin ni yoru joji kanshi o kano ni suru). Text in Japanese. Preprint, Japanese Society for General Research, Tokyo, Environmental Science Div., p. 67-68, 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Continuous monitoring techniques are described. For the realization of continuous monitoring, cooperation between inhabitants and local government is necessary. Simple and inexpensive monitoring instruments must be developed and distributed to many places. One method of continuous monitoring is to optically scan a desired area for atmospheric pollutants, particularly suspended particulates. Lasers are useful for this purpose. Visible and ultraviolet correlation spectrophotometers can be used to monitor the total concentration between two desired points with the aid of a reflecting mirror. These optical scanning methods are costly but require little manpower for their maintenance. Costs can be reduced by measuring relative values instead of absolute levels of pollutants.

52319 **APTIC NO. 74973**

Amatani, Kazuo

PROBLEMS OF CONVENTIONAL MEASURING INSTRUMENTS OF ATMOSPHERIC POLLUTION. *(Genyo taiki osen sokuteiki no mondaiten). Text in Japanese. Preprint, Japanese Society for General Research, Tokyo, Environmental Science Div., p. 65-66, 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

The reliability of air pollution measurements and monitoring equipment is discussed. The amount of sulfur dioxide discharged in Kashima, Japan was 688 normal cu m/hr in April 1970 and 7999 normal cu m/hr in April 1972, whereas the concentrations in the atmosphere as measured with an electric conductivity method, were 0.017 and 9.015 ppm, respectively. These results are not in agreement. Therefore, the measuring method must be re-examined. A similar problem also exists for the determination of nitrogen oxides with the Saltzman method. An indefinite factor exists in the conversion of nitrogen dioxide to an azo dyestuff. The oxidation of nitric oxide to NO2 also poses a problem. Nitrogen oxides discharged in the air are removed from the air if they react with alkaline substances present in air and form solid salts which are collected with dusts. A single determination of NOx in air is sometimes meaningless.

52320 **APTIC NO. 76648**

Corte, G. L., R. S. Thomas, R. C. Lao, and L. Dubois

THE PREPARATION OF SILVER ABSORBERS FOR SAMPLING AIRBORNE MERCURY. *Mikrochim. Acta, 1975 I (5/6):533-538, 1975. 1 ref.*

The procedure for the preparation of MC-8 silver absorbers is described. Silver gause, 30-60 mesh, is used after heat activation at 800 C. The construction of the samplers is followed by a description of a simple method for the calibration of individual absorber units to achieve a standard resistance to air flow at 1.5 liters/min.

52321 **APTIC NO. 74309**

Dalborg, Astrid and Lars Uhlin

CONDUCTOMETRIC DETERMINATION OF HYDROGEN SULFIDE IN FLUE GASES. *(Konduktometrisk bestamming av svavelvate i rokgaser). Text in Swedish. Svensk Papperstid. (Stockholm), no. 2:52-55, Feb. 1975. 7 refs.*

Laboratory and field experiments with a method of conductometric determination for hydrogen sulfide present in flue gases from soda recovery boilers in pulp mills are described. While preliminary experiments revealed negligible interference of carbon dioxide and sulfur dioxide at pH values of 2.5 and over, the elimination of SO2 from the flue gas to be analyzed by means of 5% sodium citrate at pH 5 was necessary. The gas is absorbed by a copper chloride solution in which hydrogen sulfide combines with the copper; the hydrogen increases the conductivity of the solution which is a measure of the H2S concentration in the flue gas. A semi-continuously recording conductometric instrument has been developed for H2S analysis.

52322 **APTIC NO. 74636**

Forwerg, Walter

MEASUREMENT OF EMISSIONS AND IMMISSIONS OF NITROGEN OXIDES. *(Messen von Emissionen und Immissionen der Stickstoffoxide). Text in German. Staub, Reinhaltung Luft, 35(4):142-146, 1975. 11 refs.*

The analytical determination of nitric oxide using various measurement methods and instruments is described. Measurement methods include the phenoldisulfonic acid and titration methods, infrared absorption, ultraviolet absorption, chemiluminescence, gas chromatography, catalytic or thermal oxygen separation, ion sensitive electrodes, and manual and recording photometric methods. These various methods are described, summarized and compared, together with characteristic data. Sources of errors in emission measurements are presented.

52323 **APTIC NO. 74500**

Fujie, Kimiko

ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS. *(Takan hokozoku tanka suiso no bunseki). Text in Japanese. Bunseki (Analysis), no. 3:165-171, March 1975. 25 refs.*

The analysis methods for carcinogenic polynuclear aromatic hydrocarbons (benzo(a)pyrene and several other carcinogens) are discussed. The sampling and analytical procedures of the solvent extraction- column chromatography-absorption spectroscopy, column chromatography-paper chromatography-fluorimetry, vacuum sublimation extraction-thin-layer chromatography-fluorimetry, and gas chromatography are described with some data, and characteristics of each method are discussed. Benzo(a)pyrene is often measured as an index of carcinogen. To investigate the relationship between polynuclear aromatic hydrocarbons in the atmosphere and carcinogenicity, data covering wide areas and long periods of time are required. A recent trend in analysis methods for polynuclear hydrocarbons in suspended particulates is simplification and expediency of analysis.

52324 **APTIC NO. 74646**

Goto, Hideaki

ADSORPTION OF NOX ON CYLINDRICAL FILTER PAPER. *(Ento roshi ni taisuru NOx no kyuchaku). Text in Japanese. Hokkaido Kogai Boshi Kenkyusho Ho (Rep. Hokkaido Res. Inst. Environ. Pollut.), no. 1:79-82, March 1975. 5 refs.*

Nitrogen oxides (nitric oxide plus nitrogen dioxide) at 1000 ppm were diluted with dry nitrogen or air to 200 ppm. The mixture was passed through a cylindrical filter paper (25 mm by 90 mm) fitted to a holder. The holder was placed in an electric oven, and the temperature was varied from 25 C to 300 C. The resulting gas was then led to a gas adsorption trap. For comparison, the same experiment was conducted for sulfur dioxide at 1000 ppm and 4000 ppm. The adsorption of SO2 on Toyo no. 86 R fiber glass filter paper ranged from 0.13% at 25 C to 0.5% at 300 C. The adsorption on Toyo no. 88R quartz fiber glass filter paper was remarkably lower, about 0.02%. At 4 m/sec, flow rate, the adsorption of SO2 on no. 88 R filter paper reached an equilibrium after 2 hr which was independent of temperature and the diluting gas. The adsorption rate of NOx on no. 88 R and No. 86 R filter paper was approximately 0.1%.

52325 **APTIC NO. 74986**

Heacock, R. A. and O. Hutzinger

THE USE OF ELECTRON-ACCEPTOR REAGENTS FOR THE NON-DESTRUCTIVE DETECTION OF SOME AROMATIC HYDROCARBONS AND RELATED COMPOUNDS. *Mikrochim. Acta, II(1):101-108, 1975. 19 refs.*

A procedure is described for the location and identification of some polycyclic hydrocarbons and heterocyclic compounds on thin layers by the use of several different electron-acceptors as spray reagents. The reagents used included: 2,4,7-trinitro-9-fluorenone, 2,4,5,7-tetranitro-9-fluorenone, 9-dicyanomethylene- 2,4,7-trinitrofluorene, 2,3-dichloro-5,6-dicycano-1,4- benzoquinone, and tetracyanoethylene. The aromatic and heterocyclic compounds examined were applied in quantities of 10 micrograms in a suitable solvent to Eastman chromagram non- fluorescent silica gel. The plate were sprayed with one of the six chromogenic reagents used. A preliminary survey of 20 electron- acceptor reagents with a representative group of polycyclic compounds showed these six reagents to be the best. The mass spectra of the colored complexes, formed if recorded at differen temperatures, permits the structure of both donor and acceptor moieties of the complex to be determined.

52326 **APTIC NO. 74813**

Hinsch, B., G. Rinne, and H. J. Reiser

EXPERIMENTAL COMPARISON OF THE ANALYTICAL METHODS FOR THE CONTROL OF HYDROCARBON-CONTAINING WASTE GASES FROM ENAMEL WIRE BURNING STOVES. *(Experimenteller Vergleich zweier Messverfahren zur Ueberwachung der Emission von Kohlenwasserstoffabgasen an Lackdraht-Einbrennoefen). Text in German. Draht-Fachz., no. 1:6- 11, 1975. 7 refs.*

Methods for the determination of hydrocarbons in flue gases emitted by enamel wire burning stoves are described and compared. A silica gel method which uses silica gel for the adsorption of the hydrocarbons, a hot oxygen stream for desorption, and platinum for the oxidation of hydrocarbons to carbon dioxide employs the last process quantitatively for titrametrically determining the hydrocarbon content. The method has the disadvantages of high time requirement (up to 6 hr), narrow measuring range (between 0.1 and 3 mg carbon per liter), and great dispersion (15%). Another method using a flame ionization detector is suitable for the continuous measurement of the hydrocarbon concentrations at a dispersion of 4% and a measuring range of between 0.0001 and 100 mg carbon/l. The readout is proportional to the carbon content as modified by a response factor. The hydrocarbons are burned in a hydrogen flame, and the ions thus generated between two electrodes are detected in the form of a current.

52327 **APTIC NO. 74891**

Honma, Katsunori and Kazuo Tsurubayashi

ON THE MEASUREMENTS OF RESPIRABLE AEROSOL MASS CONCENTRATION USING NEWLY DEVELOPED PIEZOBALANCE TYPE AEROSOL MASS CONCENTRATION MONITOR. *(Piezobaransu funjin-kei ni yoru fuyu funjin juryonodo no sokutei ni tsuite). Text in Japanese. Preprint, Japan Assoc. of Industrial Health and Japan Council of Industrial Physicians, Tokyo, p 164, 1975. (Presented at the Japan Association of Industrial Health, 48th, and 18th Japan Council of Industrial Physicians, Ordinary Meeting, Sapporo, Japan, July 15-17, 1975.)*

Calibration of a piezobalance dust concentration counter was attempted using a low volume air sampler. Measurement of dust concentration using a laboratory prepared standard dust sample was made by these two different methods, and their results were compared in order to determine the reliability of the newly developed piezobalance dust counter. The dust concentration measured by the piezobalance dust counter agreed with that by the low volume air sampler within + or - 10%. The advantage of the piezobalance dust counter was that it could analyze dust concentrations within 2 min even if the dust concentration was low.

52328 **APTIC NO. 74323**

Hoshika, Yasuyuki

TRACE ANALYSIS OF ATMOSPHERIC SULFUR COMPOUNDS BY GC. *(GC ni yoru taikichu biryo iou kagobutsu no bunseki). Text in Japanese. Bunseki Kiki (Analysis Instr.), 13(4):211-217, April 1975. 17 refs.*

Hydrogen sulfide, carbonyl sulfide, sulfur dioxide, and carbon disulfide concentrations in air were determined by gas chromatography with a flame photometric detector. Air (1 liter) was sampled, and the gases were collected by using a cold trap cooled with liquid oxygen. The gases were then introduced to a gas chromatograph containing 3 mm by 3 m glass column packed with 25% TCP (or TCEP) on Shimalite (60/80 mesh). The analytical conditions were as follows: column temperature, 50 C; injection temperature, 70 C; detector temperature, 205 C; and carrier gas, nitrogen at 50 ml/min. Quenching was observed for determinations of CS2 and COS by the TCEP column when n-hexane coexisted and for allylmercaptan by the TCP column when ethanol coexisted.

52329 **APTIC NO. 74567**

Hoshika, Y.

THE MEASUREMENT OF CONCENTRATION OF SULFUR COMPOUNDS IN AN ODORLESS ROOM BY THE GAS CHROMATOGRAPHY. *(Gas chromatography ni yoru mushu shitsu nai ni okeru io kagobutsu no nodo sokutei). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(19):33-37, March 1975. 6 refs.*

The experiments were performed in an odorless room, 2.16 by 2.06 sq m wide. The concentrations of hydrogen sulfide, methyl mercaptan, and dimethyl sulfide were determined in a control room by gas chromatography. Calibration curves were satisfactorily linear for all of these substances within 0.2-60 nanograms when plotted on log-log paper. Each of these substances was injected into the room at a concentration corresponding to an odor intensity of 3 units, as given by the Central Atmospheric Pollution Prevention Committee. The concentrations corresponding to an odor intensity of 3 units were 0.06 ppm for hydrogen sulfide, 0.004 ppm for methyl mercaptan, and 0.05 ppm for dimethyl sulfide. From this room, 0.1 liter of each was collected and examined by gas chromatography. The recovery was almost 100% for the three substances. When the odor intensity was 2.0, H2S and dimethyl sulfide showed a recovery of about 100%, but methyl mercaptan showed a value of 55% only. When the window of the room was opened for about 5 sec, the recoveries fell to 66, 82, and 94%, for odor intensities of 2.0, 3.0, and 4.0, respectively, for the mercaptan. The humidity in the room significantly affected the odor measurements.

52330 **APTIC NO. 74882**

Ichihara, A.

THE ACCURACY OF MEASUREMENT FOR TOTAL EMISSION OF SO2. *(SO2 haishutsuryo sokutei no seido). Text in Japanese. Yokokawa Giho (Yokokawa Tech. Rept.), 19(1):6-10, 1975. 9 refs.*

Various methods of measuring sulfur dioxide and possible sources of error are discussed. The accuracy of the measurements was also estimated. Since the cost of different measurement methods varies so greatly that an adequate selection must be made according to the emission volume. The measuring method currently in use, the Japanese Industrial Standard KO103, measures dry gas concentration. The water content of the emission gas, when it is measured directly must be corrected. A more accurate method would be to measure wet gas concentrations

52331 **APTIC NO. 74942**

Inagaki, K.

AIR POLLUTION MEASUREMENT METHODS. *(Taiki nodo no sokutei ho). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(8):24-34, Aug. 1975. 12 refs.*

Sampling and measurement methods of air pollution are discussed. The JIS methods for the analysis of air pollutants (absorbent in parentheses) include: ammonia: titration and indophenol methods (0.5 W/V% boric acid); total sulfur oxides: neutralization (3% hydrogen peroxide) and arsenazo III methods (ammonium sulfamate + ammonium sulfate, pH 5.4); sulfur dioxide: iodine titration method (ammonium sulfamate + ammonium sulfate, pH 5.4); nitrogen oxides: naphthylethyleneamine method (0.1 N ammonia water); total NOx: phenolsulfonic acid method (diluted sulfuric acid + H2O2); nitrogen dioxide: naphthylethyleneamine method (0.1 N sodium hydroxide); fluoride: lanthanide alizarin complexon and thorium nitrate-neothorin methods (0.1 N NaOH); chlorine: oitoluidine method (0.01 W/V% o-toluidine hydrochloric acid solution (pH 1.6)); HCl: mercuric thiocyanate, silver nitrate, and neutralization methods (0.1 N NaOH); hydrogen sulfide: iodine titration and methylene blue methods (zinc ammonium complex salt solution); and hydrogen cyanide: silver nitrate titration and pyridine-pyrazolone methods (2 W/V% NaOH). Infrared spectrometry is used for continuous analyses of SO2, carbon monoxide, nitrogen oxide and NH3, while conductivity and spectrophotometric methods are used for continuous analyses of SO2, chlorine gas, HCl, NH3 and NOx.

52332 **APTIC NO. 74511**

Inowaki, Shuichi and Toshiki Otake

APPLICATION OF ANALYTICAL INSTRUMENTS TO ENVIRONMENTAL POLLUTION.

(Kogai keisoku to bunseki kiki). Text in Japanese. Nippon Denki Giho (Tech. Rept. Nippon Electr. Co., Ltd.), no. 2:94-99, March 1975.

Analytical instruments used in the environmental pollution monitoring are reviewed. The methods include: ultraviolet-visible spectrometry, atomic absorption spectrometry, gas and liquid chromatography, and mass spectrometry. Atomic absorption spectrometry gives high sensitivity (ppm to ppb level) and high accuracy for most metals, and the technique seldom requires pretreatment of liquid samples. The carbon rod atomizer used in the atomic absorption technqiue gives higher sensitivity (one order better) than flame atomizers; a sensitivity as high as 10 to the -13 g can be obtained for certain elements. The carbon rod atomizer can be used for solid samples without preliminary sample treatment. Liquid chromatography is good for analyses of carbamate pesticides, polychlorinated biphenyls, and phthalic acid esters; and its use in this field is increasing. Different detectors used in chromatography are based on thermal conductivity, flame ionization, electron capture, and flame photometry. The electron capture detector is very useful for the analysis of halogen compounds, and the flame ionization detector is useful for hydrocarbon analyses. The combination of gas chromatography and mass spectrometry is one the most useful techniques for pollution analyses. Field deposition mass spectrometry gives the unfragmented mass ion and is therefore more advantageous than the electron impact method which gives many fragmented ions. Field deposition mass spectrometry is especially useful for determining the molecular weight of each pollutant.

52333 **APTIC NO. 74758**

Ito, Tomizo, Eiichi Sagawa, and Nobuyoshi Banno

QUANTITATIVE ANALYSIS OF MINUTEE CONSTITUTENTS IN STRATOSPHERE.

(Seisoken taiki biryo seibun no bunseki). Text in Japanese. Preprint, Japan Society for General Research, Tokyo, Environmental Science Div. p. 73-74., 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)

Balloon-mounted equipment for measuring minute constitutents in the stratosphere is described. A mass spectrograph of the 90 deg magnetic deflection type and equipped with an ion getter pump with an evacuating speed of 20 l/sec is used. The intended mass number for determinations is between 2 and 100, the least being for the hydrogen molecule and the greatest being for water clusters. The scanning of the mass number is made via the change of the accelerating voltage of ions. For the detection of ions, a secondary electron multiplier is used. The intended detection level is between 100 ppm and several ppb. A variable leak detector and a direct current motor are used to keep the pressure in the vacuum system constant, irrespective of the external pressure. A pressure gauge and an error amplifier control the flow rate of the sample gas. Preparatory experiments confirmed that these mechanisms are satisfactorily reliable up to a height of 30 km. For the thermal insulation of the equipment, the system is sealed in an aluminum vessel. Only the sample collector is open to the external atmosphere. Thus the effect of gases liberated from the equipment is eliminated. Measurements are going to be made in May and June of 1975.

52334 **APTIC NO. 74322**

Kakihai, Y.

EFFECT OF EVAPORATION AND CONCENTRATION OF ABSORPTION LIQUID FOR SULFUR DIOXIDE AUTOMETERS.

(Nisanka iou jido keisokuki no kyushueki no jyohatsu noshuku ni yoru eikyo). Text in Japanese. Kankyo Gijyutsu (Environ. Conserv. Eng.), 4(4):248-253, April 1975. 3 refs.

Sulfur dioxide concentrations obtained with a newly developed autometer were several ppb to more than 10 ppb lower than those obtained with a conventional autometer. The new model used a very low concentration sulfuric acid solution as the absorbent. The effect of the loss of solvent due to evaporation and mist formation on the SO2 determination was greater as the absorbent concentration increased. The amount of evaporation and mist formation depended on the temperature and humidity of the air and on the temperature of the absorbent. It increased with increasing sampling time. The amount of evaporation was reduced by lowering the absorbent temperature, but cooling condensed moisture from the air when the humidity was high.

52335 **APTIC NO. 74887**

Kato, Gen and Kazuo Tsurubayashi

ON THE DEVELOPMENT OF RESPIRABLE AEROSOL MASS CONCENTRATION MONITOR USING THE PIEZOELECTRIC SENSING PRINCIPLE.

(Atsuden kessho shindo ho ni yoru fuyu funjin juryo nodokei no shisaku ni tsuite). Text in Japanese. Preprint, Japan Assoc. of Industrial Health and Japan Council of Industrial Physicians, Tokyo, p. 161, 1975. (Presented at the Japan Association of Industrial Health, 48th, and 18th Japan Council of Industrial Physicians Ordinary Meeting, Sapporo, Japan, July 15-17, 1975, Paper 223.)

An instrument for measuring the mass concentration of suspended particles developed by the Japan Science Industrial Co. is described. The instrument utilizes the piezoelectric sensing principle. Particles are sucked into the instrument and collide with a collision plate at which particles larger than 10 micron are eliminated. The particles smaller than 10 micron enter the electric field of the corona discharge which ionizes them. The charged particles then precipitate on one of the crystal electrodes used in oscillation and the oscillating frequency changes depending upon the amount of particles deposited. The precipitation efficiency of particles on the electrode is more than 95% at applied corona current between 2 to 6 microamperes. The mass concentration measured by this instrument was compared with that measured by a filter-weighing method and both gave similar values. The instrument has many advantages compared to other techniques. It can measure the particle concentration in a shorter time; a few minutes of suction of air sample through the instrument is sufficient to determine the particle mass concentration in sample air.

52336 **APTIC NO. 74853**

Kato, Tatsuo

PRESENT STATUS OF THE TECHNIQUE AND INSTRUMENT OF ODOR MEASUREMENT.

(Akushu sokutei gijutsu to sokutei kiki no genjo). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 20(5):411-416, May 1975.

The application of a gas chromatographic method to the analysis of odorous substances, the ultra-micro analysis of the atmosphere and water, continuous measurements of odor, and gas chromatography mass spectrometry methods are discussed. At present, the basic method of odor analysis is gas chromatography. However, the lower limit of detection is in the ppm range. The required level of odor detection is the ppb range. The basis of techniques for handling minute components is low temperature adsorption or condensation. When the concentration is in the ppm range, the samples are collected iin a 1-liter bottle; when the concentration is the ppb range, the sample is collected in a 100-liter bottle. The bottles are made of Pyrex glass and are equipped with Teflon valves. The bottles are evacuated prior to the collection of samples. In the laboratory, the sample is transferred to a sample tube for gas chromatography. Water quality is also determined by gas-chromatography.

52337 **APTIC NO. 74862**

Kimura, Kikuji

CONTINUOUS DETERMINATION OF AIRBORNE DUST CONCENTRATION. *(Hendo suru funjin nodo no sokutei ho). Text in Japanese. Preprint, Japan Association of Industrial Health and Japan Council of Industrial Physicians, Tokyo, p. 160, 1975. (Presented at the Japan Association of Industrial Health, 48th, and 18th Japan Council of Industrial Physicians, Ordinary Meeting, Sapporo, Japan, July 15-17, 1975, Paper 222.)*

The effect of measurement position and time for measuring airborne dust concentration within the same room was determined by monitoring the dust continuously with a digital dust indicator. When the measurement was made for an electric welding room, variation in the dust concentration was clearly observed with the running time of the indicator. Although the average dust concentration for 3 min was 10.63 mg/cu m, the dust concentration differed by 20 to 30 times between readings made in a few seconds apart. The average dust concentration for 3 min measured at different places in the same room was 2.3 to 3.4 mg/cu m. When the similar experiment was conducted using a dust experiment room filled with cigarette smoke and two dust counters placed 50 cm apart, both counters indicated similar and steady dust concentrations over 3 min. However, when the same experiment was conducted by generating cigarette smoke continuously within the room, each dust counter indicated different patterns and the average dust concentration recorded by one counter was twice that recorded by the other. Therefore, consideration of measurement time as well as measurement place was important in the analysis of indoor dust concentration.

52338 **APTIC NO. 74894**

Kimura, Kikuji

ON THE ROKEN SAMPLER. *(Roken sanpura ni tsuite). Text in Japanese. Preprint, Japan Association of Industrial Health and Japan Council of Industrial Physicians, Tokyo, p. 158, 1975. (Presented at the Japan Association of Industrial Health, 48th, and 18th Japan Council of Industrial Physicians, Ordinary Meeting, Sapporo, Japan, July 15-17, 1975, Paper 221.)*

The portable type air sampler developed by the Institute for Science of Labor is described. The sampler is 20 by 20 by 20 cm and is mounted on a tripod, with a total weight of 4 kg. The sampler is operated by dry cells, which are capable of making three operations of 8-hour continuous sample collection at a sucking speed of 10 l/min without replacing dry cells. The filter installed is 35 mm in diameter and the use of membrane filters is also possible because of the higher sucking speed available. A voltage regulator is used to prevent power drops during the operation. The 1 l/min sucking speed was not affected by collected dust up to 10 mg. The error in the indicated amount of sucked gas, which was the compounded error in the timer and flow meter of the sampler, was determined using ten different samplers of the same type. The sucking operation was performed for 15 min and the correct gas amount passed was determined by a gas meter, which was compared with the indicated amount by the sampler. Each sampler indicated similar amounts of sucked air, but different samplers indicated different values. All values agreed within + or - 6% error.

52339 **APTIC NO. 74918**

Kodama, T. and Y. Takai

ANALYSIS OF ESTER PHTHALATE. *(Futarusan esuteru no bunseki). Text in Japanese. Bunseki Kiki (Analysis Instr.), 13(5):11-23, May 1975. 48 refs.*

The analysis of phthalic acid ester (PAE) by a steam distillation method is described. A normal-hexane solution of the sample is put into a flask to which silica gel of twice the sample volume is added. With a rotary evaporator, n-hexane is dried. Then methylation is carried out, making it possible to analyze phthalate at the ppb level. When estimation and qualitative analysis after gas chromatographic separation are difficult, the effluent is saponified to convert PAE into the carboxylic acid, followed by methylation with dimethyl formamide dimethylacetate (DMA), and PAE is measured as DMP dimethyl. Since the steam distillation method requires only a small quantity of extracted solvent, there is no need for contamination of PAE.

52340 **APTIC NO. 76738**

Kondo, H., J. Kitamura, M. Kono, S. Suzuki, K. Murakami, and C. Ono

COLLECTION AND DETERMINATION OF ESTERS OF PHTHALIC ACID IN ATMOSPHERE. *(Taiki chu no phtal san ester no hoshu oyobbi sono bunsekihoho ni tsuite). Text in Japanese. Shikoku Koshu Eisei Gakkai Zasshi (J. Shikoku Soc. Public Health), 20(1):88-91, Feb. 1975. 12 refs.*

The collection of airborne phthalic acid esters was made by passing the gas through a glass column filled with more than 5 g of activated florisil. The gas flow rate was 35 l/min at a temperature of an ice-sodium chloride mixture. The extraction of the collected ester was made with normal-hexane, ether, or ethanol. Ethanol gave the best results. The time of extraction was 5-15 min. The extraction was made with 25 ml ethanol twice. The extract solution thus obtained was turbid. This turbidity was removed when the extract was treated with 25 ml n-hexane and 100 ml distilled water. The collected ester was then determined by gas chromatography (3% OV-17 Chromosorb W of 60-80 mesh). The column was 3 mm in diameter and 1 m long. The column temperature was elevated from 150-250 C at a rate of 7.5 C/min. Nitrogen was used as the carrier gas at a rate of 40 ml/min. By this method, 2135 micrograms of dibutyl phthalate was successfully collected and determined.

52341 **APTIC NO. 74577**

Kozlov, S. T., M. I. Povolotskaya, and G. D. Tantsyrev

SETUP FOR PREPARATION OF CALIBRATION GASES WITH MICROIMPURITIES OF ORGANIC SUBSTANCES. *(Ustanovka dlya priogotovleniya kalibrovochnykh gazov s mikroprimesyami organicheskikh veshchestv). Text in Russian. Zh. Analit. Khim. (Moscow), 30(1):197-200, 1975. 7 refs.*

A procedure for the dynamic preparation of calibration gases for microquantities of organic substances is described. Air is drawn into a capillary through a Dewar vessel; before entering the latter, the air is entrained with a small, metered flow of the organic vapor pressurized with nitrogen through a capillary. The concentration of the calibration gas is determined by the ratio of the flow rates of the diluting air to that of the calibration gas. The organic substance is condensed in the capillary inside the Dewar vessel which is cooled with liquid nitrogen for combined chromatographic-mass spectrometric analysis. Calibration gas concentrations ranging from 0.000001 to 0.001% (by volume) at a relative error not greater than 15% can be prepared.

52342 **APTIC NO. 74561**

Lahmann, Erdwin

GERMAN DUTCH COMPARATIVE MEASUREMENTS OF NITROGEN DIOXIDE BY THE SALTZMAN

METHOD. (Deutsch-niederlaendische Stickstoffdioxid-Vergleichsmessungen nach dem Salzman- Verfahren). Text in German. Staub, Reinhaltung Luft, 35(4):161-162, April 1975. 6 refs.

Comparative nitrogen dioxide measurements taken by two West German institutes and two Dutch institutes using test gases in the laboratory and atmospheric air samples were performed to test the suitability of the Saltzman method for use as a standard method. The Dutch procedure was a modified version of the German procedure, and Saltzman factors of 0.96 and 1.00, respectively, were employed. The results of the comparative NO2 determinations are listed in tables, and they show good reproducibility between the institutes. They confirmed the Saltzman factor as being close to one.

52343 **APTIC NO. 74851**

Mamuro, T.

ANALYSIS OF MULTIPLE ELEMENTS BY X-RAY ANALYSIS METHOD. *(Taiki fuyujin no keiko x-sen bunsekiho ni yoru tagenso bunseki). Text in Japanese. Aisotopu Nyuzu (Isot. News), no. 248:6-7, March 1975.*

In 1972 instrumental radiation analysis and X-ray analysis were applied for quantitatively analyzing samples of dust trapped on filters. After 1974 they were adopted for the routine analysis of dust samples periodically collected by the national air surveillance network. X-ray analysis can be applied for analyzing various environmental samples, estimating around 40 elements non-destructively. The energy dispersion type, in contrast to the traditional wavelength dispersal type, is capable of taking all spectra at the same time. It is also stabe since it has no moving parts. The rate of detection is increased by more than 100 times. As thin beryllium foil is used for admitting the X-ray into the detector, low atomic number elements less than sodium cannot be detected ordinarily. For elements having an atomic number of less than 20, wavelength dispersion must be used.

52344 **APTIC NO. 74888**

Matsushita, Shukaku

ANALYSIS OF POLYNUCLEAR HYDROCARBONS IN SUSPENDED PARTICULATES BY HIGH-SPEED LIQUID CHROMATOGRAPHY. *(Kosoku eiktai kuromatogurafu ni yoru fuyu funjin chu no takan hokozoku tankasuiso no bunseki ho). Text in Japanese. Preprint, Japan Assoc. of Industrial Health and Japan Council of Industrial Physicians, Tokyo, p. 156, 1975. (Presented at the Japan Association of Industrial Health, 48th, and 18th Japan Council of Industrial Physicians, Ordinary Meeting, Sapporo, Japan, July 15-17, 1975, Paper 220.)*

Analyses of polynuclear aromatic hydrocarbons (PAH) were made by high speed liquid chromatography with an ODS-Permaphase column fitted with an ultraviolet fluorescence detector. The liquid phase used was a mixture of methanol and water. Separation of 25 different PAH, achieved using the standard compounds, indicated that the logarithm of the retention time for PAH increased linearly with the increased carbon numbers when a constant flow rate of liquid phase was used. The minimum amount of sample required was a few microliters of each PAH. A vacuum sublimation extraction technique was used in order to obtain the concentrated PAH sample from airborne dust. With this technique, 100% pyrene, 98.7% chrysene, 96.6% benzo(a)pyrene, and 99.6% benzo(a)anthracene could be extracted from an airborne dust sample. The liquid chromatogram of the sample extracted from airborne dust was taken. When the conventional UV detector (250 nm) was used, the chromatogram obtained was complicated and more than two compounds appeared in a single peak. In order to improve the specificity of detection for single compounds, the excitation and detection wavelengths were selected for each individual compound which also gave higher sensitivity. The excitation wavelengths selected were 335, 290, 270, 370, 440, and 335 nm for pyrene, benzo(a)anthracene, chrysene, benzo(a)pyrene, and perylene, and benzo(a)pyrene respectively, while the detection wavelengths selected were 375, 415, 365, 405, 475, and 380 nm correspondingly.

52345 **APTIC NO. 74587**

Munemori, M.

A QUANTITATIVE ANALYTICAL METHOD FOR SMALL AMOUNTS OF FORMALDEHYDE. *(Biryo no formaldehyde no teiryo hoho ni tsuite). Text in Japanese. Shimazu Kagaku Kiki News (Sci. Instrum. News), 16(1):1-5, Feb. 1975.*

Methods for the quantitative analysis of formaldehyde are reviewed. The pararosaniline method utilizes the coloring effect of formaldehyde in pararosaniline solution and measures the absorbance of the color solution near 560 nm. A solution of 0.18 ppm HCHO gives an absorbance of 0.10. Acetaldehyde and propionaldehyde at high concentration interfere with the analysis. The chromotropic acid method utilizes the coloring effect of formaldehyde in 1,8-dihydroxynaphthalene-3,6- disulfonic acid solution and measures the absorbance near 580 nm. High sulfuric acid concentration and suitable reaction temperature are essential for accurate determination. A solution of 0.19 ppm HCHO gives an absorbance of 0.10. The reagent 2-Hydrazinobenzothiazole is used for high sensitivity determination of HCHO. The absorbance of the blue solution after potassium ferricyanide, DMF, and potassium hydroxide are added, is measured near 582 nm. The MBTH method, which has the highest sensitivity, uses 3-methyl-2-benzothiazolone hydrazone and measures the absorbance of the blue solution near 628 nm after sulfamic acid and ferric chloride are added.

52346 **APTIC NO. 74537**

Naito, Keikichi, Hiroshi Tanizaki, Shoji Ito, Fumio Ito, Y. Yakuo, Isao Yamashita, and Tetsuo Hosokawa

LASER RADAR AND ITS APPLICATIONS. *(Reza reda to sono oyo). Text in Japanese. Nippon Denki Giho (Tech. Rept. Nippon Electric Co., Ltd., no. 2:88, March 1975.*

The mobile laser radar apparatus at the Japan Meteorological Association is described. The apparatus was developed and manufactured by Nippon Electric Co. for the remote sensing of air pollution. The sensor utilizes the Mie scattering technique. The unit consists of two automobiles one of which carries the lasser radar basic unit and the other of which carries the control unit for the basic unit. The laser employed is a Q switch Nd-YAG at a wavelength of 0.53 micron and with maximum power per pulse more than 1 MW. The laser direction can be scanned automatically over 60 deg. The unit is equipped with a 50-centimeter telescope to detect the scattering light. The telescope is adjusted to view a 2-meter radius of scattering space. The mobile unit can observe smoke diffusion from high stacks and pollutant distributions over roads.

52347 **APTIC NO. 74833**

Nakajima, Toshiaki

DETERMINATION OF ODOROUS COMPOUNDS: DETERMINATION OF FATTY ACIDS IN WATER BY GAS CHROMATOGRAPHY. *(Akushu busshitsu no teiryo ni tsuite: gas chromatography ni yoru suichu no shibosan no teiryo). Text in Japanese. Hokkaido Kogai Boshi Kenkyusho Ho (Rep. Hokkaido Res. Inst. Environ. Pollut.), no. 1:177-178, March 1975. 4 refs.*

A method for the determination of fatty acids in water is described. Acetic acid, propionic acid and normal-butyric acid were dissolved in deionized water, and the solution was diluted to 50 ml. Phosphoric acid (15 normality, 2 ml) was added to the solution, and steam distillation was carried out. The distilling flask was kept at 102-102 C, and the distillation was terminated when the distillate showed neutral by testing with pH paper. The distillate was neutralized with 10% sodium hydroxide solution, using phenolphthalein as the indicator. The solution was evaporated to dryness by direct fire. The residue was dissolved in 10 ml of 3 normal phosphoric acid (20 ml when 400 mg of sample was used); and the solution was analyzed by gas chromatography with a flame ionization detector. The analytical conditions were as follows: column: 3 mm by 2.7 m glass tube packed with FFAP (15%) on chromosorb W (60/80 mesh); column temperature: 100-200 C; carrier gas: helium at 50 ml/min.

52348 **APTIC NO. 74681**

Ochiai, Hidejiro

CONTINUOUS ANALYSIS OF NITROGEN OXIDES BY NON-DISPERSIVE INFRARED ABSORPTION (NDIR) METHOD. *(Hibunsan sekigai Kyushu-ho ni yoru chisso sanka butsu no renzoku bunsekiho ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(2):98-105, 1975.*

Non-destructive infrared analysis is used to analyze nitrogen oxides by irradiating the sample at 5.1 to 5.7 micron. Compounds in flue gases that interfere with the NOx absorption in IR are water vapor and carbon dioxide. The nitrogen dioxide, which constitutes 5-10% of the total NOx in flue gases, must be converted to nitric oxide by using a converter. The development of a multi-layer interfering filter has solved the problem of interference by CO2. The stable detection range of NDIR has been reduced to 0-200 ppm. The development of NDIR with a more sensitive detection range requires further improvements in coping with interference by other compounds. Indicator drifting is usually caused by instability of the light source and staining of the detecting cell. Inert gas is introduced to the heating body to avoid overheating of the heating body and to stabilize it. Dusts and water vapor in the sample gas require treatment before NOx is analyzed. Triple filters are used for this purpose.

52349 **APTIC NO. 74540**

Ogou, S.

METERING OF STACK GAS FLOW BY PURGE TYPE SWIRL FLOWMETER. *(Purge shiki uzumaki ryuryo kei ni yoru endo haigasu ryuryo no keisoku). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc. Japan), 24(2):6-11, Feb. 1975.*

A general description is given of a purge-type swirl flowmeter, including its assembly and maintenance. The flowmeter consists of a detector which produces and detects the swirl, an amplifier and purge set which amplifies the electric pulse from the detector and supplies constant purge flow to the detector probe in the detector, and a transformer which transforms the amplified pulse frequency to standard analog signals. The flowmeter has a detecting range of 4 m/sec to 30 m/sec and an accuracy of + and - 1% between 8 m/sec and 30 m/sec. The temperature range is 0 to 300 C and the pressure range is minus 1000 mm water to plus 1000 mm H2O. The dust concentration in the flue gas must be below 200 mg/cu m. The flowmeter is widely used in flue gas desulfurization apparatus.

52350 **APTIC NO. 74664**

Ogura, Yoshizaku

OFFICIAL APPROVAL OF NITROGEN OXIDES MEASUREMENT METHOD. *(Chisso sankabutsu sokuteiho no kentei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(3):89-93, 1975.*

Two JIS (Japan Industrial Standards) methods, the rapid phenol disulfonic acid (PDS) method and the naphthylethylenediamine (NEDA) method, were examined for their dependability. Standard nitric oxide gas from a generator was diluted twice and then introduced into the sampling tube. Hydrogen peroxide solutions (0.5% and 3%) were used for the NEDA method and the nitrite formation coefficient was calculated. Sulfur dioxide at 250, 750 and 1200 ppm was added as an intefering substance. Results of standard gas analyses showed that both methods were highly dependable between 0-1000 ppm. Lower values of NO were obtained by both methods when sulfur dioxide existed as foreign material.

52351 **APTIC NO. 74808**

Okuda, Norikazu and Kazuo Okuda

SMOKE MONITORING APPARATUS. *(Haien kanshi sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-11265. 4p., April 30, 1975. (Appl. April 16, 1969, 1 claim).*

A smoke monitoring device based on the Ringelmann smoke chart was developed. The device consists of a detection system with a signal generator and digital indicator for smoke density and average density rate (%) of a given period of time based on the equivalent unit count. An electric signal corresponding to the density, determined by measuring the comparative transmittancy, is transmitted to the counter and indicated by the equivalent unit count. The measurement is made automatically at a given interval (e.g., 30 sec) and after a certain number of measurements the smoke density rate is computed by the equation average density rate (%) equals 20 times the equivalent unit count/number of measurements (Ringelmann five-point system, one point is equivalent to 20%).

52352 **APTIC NO. 74861**

Okumura, Tameo, Jiro Shibata, and Michio Nagai

INVESTIGATION ON SPECIAL POISONOUS SUBSTANCES IN THE SURROUNDINGS. I. THE ANALYSIS OF AROMATIC AMINES BY ECD GAS CHROMATOGRAPHY. *(Kankyo-chu no tokushu yagai busshitsu no chosa kenkyu. I. Hokozoku amine-rui no ECD Gas chromatography ni yoru kenkyu). Text in Japanese. Preprint, Japan Society of Pharmacy, Tokyo, p. 117, 1975. (Presented at the Japan Society of Pharmacy, Annual Meeting, 95th, Nishinomiya, Japan, April 4-6, 1975.)*

The analysis of aromatic amines by gas chromatography with electron capture detection is described. A sample prepared by ether extraction is mixed with a dilute ether solution of bromine. The excess Br is decomposed with an aqueous solution of sodium sulfite. The ether layer is dried with anhydrous sodium sulfate. The solution is then poured into the chromatograph. Microanalysis is successfully made for aniline, ortho-, meta-, and para-toluidine, 3,4-, 2,5-, 2,3-, and 3,5-xylidene, alpha- and beta-naphthyl amine, p-aminobiphenyl, and benzidine. The separation among isomers is satisfactory. The sensitivity of the method is increased by the introduction of Br by substitution. Moreover, the separation is improved because of the difference in the number of the substituted bromine. The 2,4- and 2-6-xylidenes are not determined by this method. An example of the analysis of gasoline by this method is described. Silicone OV-17 and (3% dimethyl sulfide were used together with nitrogen gas which was used as a carrier. The rate of flow of nitrogen was 40 ml/min. The column temperature was 145 C.

52353 **APTIC NO. 74829**

Oyake, Tatsunori

INVESTIGATION ON MEASUREMENT LEVEL OF CONDUCTIMETRIC SULFUR DIOXIDE ANALYZER. *(AP meta ni tsuite no ichi kosatu). Text in Japanese. Hokkaido Kogai Boshi Kenkyusho Ho (Rep. Hokkaido Res. Inst. Environ. Pollut.), no. 1:13-21, March 1975. 3 refs.*

Factors affecting the conductimetric measurement of sulfur dioxide were analyzed. Dust filter materials showed various SO2 adsorption rates, ranging from 6.8% for a used Gelman A filter paper to 27.2% for a new Gelman A filter paper at an SO2 concentration of 0.5 ppm. The rates of SO2 adsorption on the gas inlet tube ranged from 3.2% for teflon to 8.6% for polyvinyl chloride to 15.6% for glass at the same SO2 concentration. Nitric oxide, nitrogen dioxide, and hydrogen chloride at concentrations below 0.2 ppm and carbon monoxide below 40 ppm did not effect the measurement. Higher and lower flow rates were observed at temperature lower and higher than 15 C, respectively, with that at 15 C as a standard. Loss of the solvent due to evaporation resulted in up to a 1.60% difference in measurement values.

52354 **APTIC NO. 74363**

Rothe, Karl Werner, Uwe Brinkmann, and Herbert Walther

APPLICATION OF TUNABLE DYE LASERS FOR THE EXAMINATION OF GASEOUS AIR POLLUTANTS: MEASUREMENT OF THE NO2 CONCENTRATION IN THE ATMOSPHERE. *(Anwendung frequenzveraenderlicher Farbstofflaser zur Untersuchung von gasfoermigen Luftverunreinigungen: Messung der NO2-Konzentration in der Atmosphaere). Text in German. Staub, Reinhaltung Luft, 35(4):146-150, April 1975. 9 refs.*

Remote measurements of atmospheric nitrogen dioxide concentrations by means of a tunable dye laser are reported. A laser was set up outside of a chemical factory at a distance of 750 m. The laser beam crossed the smoke plume at a right angle 300 m from the stack top. For the determination of the distribution of the NO2 concentration across the plant premises, a laser was set up on the upper floor of a building from where the plant premises could be overlooked. Measurements were taken in five directions with 40 laser shots sent into each direction. The concentrations ranged from 3.5 ppm in the center to 1 ppm in the remote sections of the plant. In the smoke plume, the NO2 concentration was 7.0 ppm. The results are graphically illustrated. The theoretical basis of the measurement principle is briefly outlined, and the apparatus is described.

52355 **APTIC NO. 74562**

Sato, S.

MEASUREMENT OF SMELL AND STATISTICAL METHODS. I. HYPOTHESIS TEST. *(Nioi no sokutei to tokei teki hoho. I. kasetsu kentei no kangae-kata). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(19):8-15, March 1975.*

Statistical methods for analyzing sensory tests of odor are discussed. A two-fifths test is described. An aqueous solution (20 ml each) is placed in five stoppered flasks. Three of these contain pure water, and only two contain the odorous substance. The person must correctly identify the two flasks with the odorous substance. The probability that a person selects the two bottles by chance is 10%; and when this test is repeated once more for the same person, the probability falls to 1%. Hypothesis testing is also described.

52356 **APTIC NO. 74989**

Sebayashi, Tsutae

APPLICATION OF GAS CHROMATOGRAPH-MASS SPECTROMETER TO AIR POLLUTION ANALYSIS (2). *(Taiken osen bunseki eno GC/MS no oyo (2)). Text in Japanese. Jasco Rept., 12(6):36-40, June 1975. 35 refs.*

Application of gas chromatography mass spectrometry (GC/MS) to simultaneous analysis of multiple components of air pollution is discussed. Mass fragmentography (MF) is the method whereby multiple ion detection is continuously recorded. In particular, quadrupole mass spectrometry (QMS) detects m/e (mass/electron), which is proportional to the radio frequency voltage, which is varied by linear changes in direct current voltage. Compared to the magnetic field type of MS, QMS is not limited by the number of channels for m/e, nor by the range of masses. Many ion peaks can be selected for any range of masses. It is possible to separate components of gasoline, photochemical smog (including detection of trichloroethylene in the upper atmosphere), carcinogenic components in the atmosphere, and components of automobile exhaust gases. In the future atmospheric pollutant analysis will utilize a combination of GC/QMS and other GC and LC (liquid chromatography) procedures.

52357 **APTIC NO. 74792**

Suzuki, F., I. Ogawa, and M. Minakami

INVESTIGATION ON HARMFUL SUBSTANCES IN STACK GASES FROM STATIONARY SOURCES (I): DETERMINATION OF IODINE IN STACK GASES BY AN IODIDE SELECTIVE ELECTRODE. *(Kotei hasseigen ni okeru Yugai bushitsu ni kansuru kenkyu (dai I ppo): Yoso ion denkyoku ho ni yoru haigasu chu yoso no teiryoho). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 21(2):84-88, 1975.*

Sample solution was prepared by adding 25 ml of 0.1 N sodium hydroxide adsorbent to two absorbing tubes and introducing flue gas at 0.5-2.0 l/min while the sampling tube was heated at 140 C, followed by addition of 2 ml of 1.5 N sodium hypochlorite to the resulting solution which had an iodine concentration of 0.05-5 micro l/ml. Saturated hydrazine sulfate solution (10 ml) was added to 10 ml of the sample solution, and the iodine concentration was determined by using a model of 94-53 A iodide selective electrode. A plot of mV vs. log concentration gave a straight line, having a slope of -60.6 + or -1.8 mV. Interference by other ions, e.g., bromide, sulfite and chloride was negligible.

52358 **APTIC NO. 74872**

Suzuki, Takamasa, Kosei Ikebe, and Michikuni Shimo

THE DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION OF SUBMICRON PARTICLES BY THE STATIC METHOD. III. AUTOMATION OF THE APPARATUS AND THE EXAMPLES OF MEASUREMENT. *(Static choshiki ni yoru submicron ryushi no ryukei bunpu sokutei. III. Sochi no jidoka to sokuteirei). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 76, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

A static method for the determination of submicron aerosol particle size distribution is described. The measurements were made with a set of 16 diffusion tubes. A Pollack counter was first evacuated and then filled with 0.2 atmospheres air pressure. At a given time, one of the diffusion tubes was connected to the counter, and the pressure was raised to 1 amosphere by the addition of filtered air. Then the pressure was increased to 1.2 atmospheres via the introduction of filtered air. This air was then allowed to expand adiabatically. The decay of light due to fog formed by the expansion was read out as a change in the output of a photocell. From the change in this output, the number of aerosol particles per unit volume was determined with the aid of a calibration curve. The procedures were done manually, though now most of the procedures are automated. Measurements were made on the campus of Nagoya University and also in Kiso-Fukushima City, and the results for particles larger than 0.2 micron in diameter (via light scattering) corresponded well with data obtained by the static method on smaller particles. The static method utilized the diffusion of aerosol particles.

52359 **APTIC NO. 74685**

Tachibana, K.

FIRST INVESTIGATION REPORT OF THE SECTIONAL MEETING FOR SOX, NOX MEASUREMENTS (3). *(SOx, NOx keisoku chosa bunkakai dai ichiji chosa hokokusho (3)). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(4):37-44, 1975. 5 refs.*

Four methods for sulfur oxides analysis including the neutralization method, Alusenazo III method, barium chloranilate method, and iodine titration method are described. The neutralization method uses aqueous hydrogen peroxide solution to collect about 20 l of sample gas and titrates the total SOx with N/10 sodium hydroxide solution. The method is suitable for gas containing more than 500 ppm SOx with little interference by other gases. The Alusenazo III method also uses hydrogen peroxide solution as absorbent. The solution is then mixed with isopropyl alcohol and acetic acid and titrated with barium acetate using Alusenazo III solution as indicator. The method is suitable for analyzing 50 to 2000 ppm SOx. The barium chloranilate method uses hydrogen peroxide solution as absorbent and after the additions of buffer solution, ethyl alcohol, and barium chloranilate, the absorbance of the solution is measured spectrophotometrically to determine the total SOx concentration. The suitable range of SO2 concentration of this method is 200 ppm to 2000 ppm. The iodine titration method uses sulfamate solution as absorbent and titrates SOx with iodine. The suitable range of SOX concentration is 50 ppm to 2000 ppm and the titration is interfered with by hydrogen sulfide and formaldehyde.

52360 **APTIC NO. 74491**

Tominaga, Hiroshi, Muneaki Aneo, Tsuyoshi Imahashi, and Noboru Tachikawa

AN ELEMENT-CLASSIFIED GRADING ANALYSIS OF ATMOSPHERIC PARTICULATE BY LIQUID PHASE SEDIMENTATION METHOD. *(Ekiso chinko-ho ni yoru taiki fuyujin no genso betsu ryujin bunseki). Text in Japanese. Japan Radio Isotope Assoc. and 48 other associations, Tokyo, p. 70, 1975. (Presented at the Radioisotopes Symposium in the Physical Sciences and Industry, Annual Meeting, 12th, Tokyo, Japan, June 18-20, 1975.)*

Atmospheric particulate matter (10 mg) collected on an 0.8 micron millipore filter was added to an aqueous medium and then subjected to ultra-sound for 30 min to achieve particulate dispersal. The solution was then allowed to precipitate in a basin 14 mm in diameter and 5-10 cm in height. About 12 samples were taken during a period of 3 days beginning at 2 min after the sedimentation. The samples were dried and analyzed by energy dispersion type X-ray fluorescence. Calculations showed that potassium, calcium, titanium, vanadium, chromium, manganese, iron, nickel, copper, zinc, and lead had apparent diameters of 5.5, 8.2, 5.9, 4.8, 4.4, 5.7, 6.3, 4.9, 7.4, 5.7 and 3.8 micron, respectively. The method requires only a small amount of sample and provides a wide range of grading analysis.

52361 **APTIC NO. 74925**

Tsujino, Ryuzo

PROBLEMS IN GRAPHITE FLAMELESS ABSORPTION ANALYSIS. *(Gurafaito furemuresu genshi kyuko bunseki no mondaiten). Text in Japanese. Preprint, Japan Society of Spectroscopy, Tokyo, p. 47-57, 1975. 10 refs. (Presented at the Japan Society of Spectroscopy, Lecture Meeting, Tokyo, Japan, May 21-22, 1975.)*

Graphite flameless absorption analysis is capable of high sensitivity with very little sample and does not require pretreating the organic sample. Little sample is required due to the fact that the atoms stay for a long time in the photo-axis of the hollow negative pole discharge tube. The high sensitivity is attributed to the fact that the sample is not diluted by flame gas and retains a high density of atoms. If charring of organics is carried out in the presence of oxygen before atomization, the time required for analysis of a sample such as whole blood is reduced drastically. The graphite tube electric current is altered in three stages to atomize the sample. In the first stage, a low electric current heats the solvent to evaporation. The sample adheres to the bottom inside of the tube as a residue. In the second stage, charring is carried out in order to break down the sample, heating the sample in the presence of air or inactive gas to break down organics and convert them into ash. Most of the organics, when heated at about 350 C, become amorphous carbon. With oxygen the amorphous carbon quickly reacts with oxygen to convert carbon dioxide to carbon monoxide. Oxidation of graphite, which forms the tube, is very little. Inorganic metal salts do not evaporate and remain in the tube. In the third stage, atomization takes place. An electric current of 300 amperes is used to heat the tube quickly (3000 C/5 sec). The metal in the sample which remains in the tube becomes gasified, turning into free atoms, and absorbs the light of the hollow negative pole lamp. At present, graphite flameless atomic absorption is applied to basic chemical research, pollution control, blood analysis, the petrochemical industry, the food industry, water works, and boiler water analysis in Japan.

52362 **APTIC NO. 74890**

Yoshida, Yasuhisa, Kimikazu Kono, Nishiki Iwasaki, Tadashi Takayama, and Akira Harada

STUDIES ON SAMPLING AND MEASUREMENT METHOD OF ORGANIC SOLVENTS IN THE AIR. *(Kankyo chu yukiyozai no sanpuringu oyobi sokutei hoho no kento). Text in Japanese. Preprint, Japan Assoc. of Industrial Health and Japan Council of Industrial Physicians, Tokyo, p. 26, 1975. (Presented at the Japan Association of Industrial Health, 48th, and 18th Japan Council of Industrial Physicians, Ordinary Meeting, Sapporo, Japan, July 15-17, 1975, Paper 101.)*

A sampling technique using plastic bags and glass syringes for gaseous organic solvents is described. The plastic bags tested were of polyethylene, vinyl chloride, vinylidene chloride, saran polyethylene laminate, and vinyl fluoride. From 20 to 100 ppm of toluene, methyl ethyl ketone, or methanol was placed in each sampler and the concentration of each organic solvent in the sampler was determined by gas chromatography 7 days after the sampling in order to determine the loss of organic solvents in the samplers during this period. The loss of these solvents was high in the polyethylene and vinyl chloride bags, while the loss in the vinyl fluoride, vinylidene chloride, and saran polyethylene laminate bags was small. When 100 ppm toluene was added to the bags, the vinyl chloride bag lost all the toluene after 3 days and the polyethylene bag lost it all after 5 days, while the loss of toluene by the vinyl fluoride and vinylidene chloride bags after 7 days was 5% and 40% respectively. The loss of organic solvents was faster when the gaseous solvents in lower concentration were added to the bags. The loss of solvent in the glass syringe was also large. When the syringe was filled with 100 ppm acetone, it lost 65% of the initial acetone after 7 days, while the vinyl fluoride bag retained 97% of the acetone even after 7 days. The vinyl fluoride bags were best for sampling organic solvents among the samplers examined. The gaseous organic solvents in low concentration could be concentrated by a Poropack-Q column; therefore, gas chromatography-mass spectrometry could be used to determine low level organic solvents.

52363 **APTIC NO. 74663**

Yoshizawa, S.

AIRBORNE DUST. *(Fuyu funjin). Text in Japanese. Kuki Chowa Eisei Kogaku (J. Japan Soc. Heating, Air-Conditioning, Sanitary Eng.), 49(3):60-65, March 1975.*

Measurements of airborne particulates in buildings are described. The measurement methods are summarized as follows: low flow rate weight method: for particulates under 10 micron and suitable for concentrations higher than 0.05 mg/cu m, but not applicable to continuous measurement; digital duster: for particulates under 10 micron at concentrations between 0.01-0.5 mg/cu m and applicable to continuous measurement; filter paper dust meter of the Labor Research Institute: for particulates under 10 micron at concentrations between 0.01-0.2 mg/cu m and applicable to continuous measurement; duster 2000: same as the filter paper dust meter but not applicable to continuous measurement; tape air sampler: for particulates under 10 micron at concentrations higher than 0.05 mg/cu m and applicable to continuous measurement; cascade sampler: for particulates between 0.5 and 100 micron and not applicable to continuous measurement; and the automatic micro-particle detector; for particulates between 0.3 and 10 micron and applicable to continuous measurement.

52364 **APTIC NO. 74346**

PRESENT STATUS AND FUTURE OF ANALYTICAL INSTRUMENT FOR POLLUTION. *(Kogai keisoku kiki no genjo to tenbo). Text in Japanese. Puranto Enjinia (Plant Eng.), 7(1):31-34, Jan. 1975.*

A general discussion of the present status of the Japanese analytical instrument industry, measurement method policies and conditions for standardization is presented. The total production of air pollution instrumentation increased from 6743 units for a total cost of about $22,500 in 1971 to 54,247 units costing $60,000 in 1974. The instruments included those for the detection of carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen oxides, total hydrocarbons, hydrogen fluoride, chlorine and chlorinated compounds, particulates, automotive exhaust gases, oxidants, atmospheric metals, and odors. The Japan Electric Instrument Industry Association began establishing examination standard models for air pollution instruments in 1972. Standard models of polarography, spectrophotometry and gas chromatography were scheduled for completion in 1974.

52365 **APTIC NO. 74399**

TECHNICAL DATA ON X-RAY SPECTROMETRY: MEASURING METHODS FOR POLLUTION SUBSTANCES IN ATMOSPHERIC DUSTS, PART 1. *(Keiko x-sen bunseki tekunikaru deta: taiki fuyufunjin chu no kogai bushitsu sokutei ho, 1). Text in Japanese. Toshiba Rebyu (Toshiba Rev.), 30(4):359-360, April 1975.*

An X-ray fluorescence technique for the analysis of metals in atmospheric dust is described. The technique offers the advantages of simultaneous determination of different metals, high sensitivity, and rapid and nondestructive analysis. The dissolution of collected dusts is not necessary if atmospheric dusts are collected on a filter. The technique is applicable for both quantitative and qualitative analyses. Air samplers that can be used for the dust collection include high volume, low volume, and tape air samplers. The characteristics of the collection filter are important. Desirable filter characteristics include a low metal impurity content, high collection efficiency, good durability for X-ray, and good mechanical strength. Glass-wool filters and cellulose filters do not meet these requirements; however, some membrane filters are suitable for use in X-ray fluorescence analysis.

52366 **APTIC NO. 74471**

Shizuoka Prefectural Government

ENVIRONMENTAL POLLUTION MONITORING SYSTEM. *(Kogai Kanshi taisei). Text in Japanese. In: Environmental White Paper, 1974, p. 300-303, 1975.*

For efficient air pollution control, the accurate and expeditious measurement of pollution is essential. In Shizuoka Prefecture, the concentrations of sulfur oxides, suspended particulates, oxidant, nitrogen oxides, hydrocarbons, carbon monoxide, hydrogen fluoride, and hydrogen sulfide have been constantly monitored. The list of automatic measurement instruments used as of Dec. 1973 includes 66 automatic SOx analyzers, 26 NOx analyzers, 5 HC analyzers, 7 CO analyzers, 10 HF analyzers, and 10 H2S analyzers. Microanalyzers such as the X-ray microanalyzer for the measurement of micro-amounts of pollutans (such as polychlorinated biphenyls and data processing systems were acquired in 1973. A list of measurement instruments used as of Dec. 1973 for air, water, noise, vibration, and other pollution measurement is also given.

52367 **APTIC NO. 74575**

DIGITAL SCANNING SYSTEM FOR POLLUTION MEASUREMENT. *(Kogai Keisokuy Dijitaru Shitsuryo Sosa System). Text in Japanese. Densoken Nyusu (Tech. News Electron. Technol. Res. Lab.), no. 303:1-4, April 1975.*

A digital mass scanning system which is capable of making continuous measurements of multiple elements around 0.1 ppm is described. The scanning range is between 1-255, and the scanning time for one substance, 11 steps, is 0.01-20 sec. The scanning can be repeated any number of times. Saw-tooth waves occur between 0.01-20 sec, and synchronize with wave rise, a pulse being generated. The number of pulses is calculated with a counter, and an electric voltage proportional to the pulse is generated by stages. The voltage is adjusted so that each saw-tooth wave from the timer corresponds to a given substance. By opening and closing an electronic circuit gate which receives the ion signal and is synchronized with the change in the voltage of the saw-tooth wave, a one to one correspondence between the substance and ion is guaranteed. The data are read out by a computer or sent to a memory circuit. The data are immediately processed, and necessary information is sorted out and tabulated. Examples of measurements by the system are given and are compared with results obtained by an ordinary analog method to illustrate the systems high sensitivity.

52368 **APTIC NO. 74845**

MEASUREMENT OF ATMOSPHERIC POLLUTANTS. *(Taiki osen busshitsu no sokutei jikken). Text in Japanese. Shigaku Kyoiku Kenkyusho Kiyo (J. Jap. Private Sch. Educ. Inst.), no. 23:63-75, 1975.*

Studies of simplified methods of determining various atmospheric pollutants were performed. Measurements with Kitagawa detecting tubes were made in front of Shibuya Station in Tokyo on October 27, 1973. One round of measurements took about 40 min. The number of cars that passed the site was counted initially for 8 min. Then the nitrogen dioxide content was determined. The measurement took 8 min. Sulfur Dioxide was determined and took 5 min. Hydrocarbons and carbon monoxide took another 8 min each. The number of cars was about 7000-12,000 between 0900 hr and 1800 hr. The heaviest traffic occurred around 1000 hr, and the least traffic occurred around 1300 hr. A simulation experiment of smoking was also performed. A simplified model of smoking indicated that the concentration of CO in the mouth is as high as 10,000-15,000 ppm. The simplified measurement of sulfur dioxide and nitrogen dioxide by the use of a small piece of an alkaline filter was also investigated. A photoelectric colorimeter gave an excellent demonstration of the pollution due to SO2 and NO2. A simplified determination of NO2 by the Saltzman method was also performed.

52369 **APTIC NO. 74893**

Kanagawa Prefectural Environmental Center

AIR POLLUTION BY SUSPENDED PARTICULATE MATTER AND ITS MONITORING METHODS. *(Fuyu ryushijyo busshitsu ni yoru taiki osen to sono sokutei hoho ni tsuite). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama- Kawasaki Ind. Area), no. 17:150, Feb. 1975. 20 refs.*

Air pollution by suspended particles in the Kanagawa Prefecture was studied by measuring the atmospheric dust concentration. The effect of measurement technique by different instruments was also studied for the digital dust counter (of scattering type), low volume air sampler, high volume air samplers with and without cyclone particle separators, and Andersen samplers. The dust concentration measured by the digital dust counter for 5 locations in the prefecture indicated that the concentration in summer was higher than that in winter; for example, the dust concentration in July ranged from 56 micrograms/cu m to 157 micrograms/cu m (average 109 micrograms/cu m) and that in January ranged from 20 to 60 micrograms/cu m (average 37 micrograms/cu m). The dust concentration was higher during night than at daytime. The atmospheric humidity affected the observed median value at the dust particle size. At 40% humidity the median particle size was 2.8 micron which decreased with increased humidity; it was 1.3 micron at 60% humidity. The range of vision with atmospheric dust concentration decreased nearly linearly from 25 km to 1 km at dust concentrations of 30 micrograms/cu m and 600 micrograms/cu m respectively. The correlation between different instruments for measured dust concentrations was highest between the high volume air sampler and the low volume air sampler; the correlation factor was 0.90. The poorest correlation was between the digital dust counter and the high volume air sampler with the cyclone; the correlation factor was 0.69.

1974

52370 **APTIC NO. 74538**

Ando, H., Y. Izawa, and C. Yamanaka

QUENCHING OF NO2 FLUORESCENCE BY YAG LASER. *(YAG reza ni yoru NO2 keiko no kuenchingu). Text in Japanese. Preprint, Inst. of Electrical Engineers of Japan, Tokyo, p. G278, 1974. (Presented at the Institute of Electrical Engineers of Japan, Kansai Branch Meeting, Kyoto, Japan, Nov. 1974, Paper G10-22.)*

The resonance fluorescence of nitrogen dioxide detected by a YAG laser is studied. The NO2 gas was placed in a fluorescence cell and a fluorescence signal was observed. The fluorescence lifetime was measured by an oscilloscope and quenching of fluorescence was observed with the addition of air into the fluorescence cell. The lifetime of 4.11 torr NO2 was about 100 nanosec; it was 20 nanosec with the addition of air. Twenty nanosec was the limiting value and was the value of the pulse width of the YAG laser. The cross section of fluorescence was determined from the relation between the observed signal intensity and NO2 concentration, and was 1.15 times 10 to the -28 power sq cm/signal. Therefore, by using the same instrument, 5 ppm NOx could be detected from a 100 m distance if a 100 KW laser and a collection mirror with 30 cm diameter were employed.

52371 **APTIC NO. 76729**

Ishida, K., A. Shigeta, A. Endo, I. Maeda, and W. Kawai

STUDIES ON MEASURING METHODS FOR VINYL CHLORIDE MONOMER; STUDIES ON A METHOD OF MEASURING HARMFUL GASES, PART 2. *(Enkabiniru monoma no sokutei ho ni kansuru kenkyu; yugai gasu sokutei hoho no kansuru kenkyu, dai 2-ho). Text in Japanese. Okayama-ken Kogai Boshi Center Kenkyu Hokoku (Bull. Okayama Prefect. Pollut. Co Cent.;, 2(1):12, 1974.*

Effects of sampling time, ultraviolet radiation, and type of glass on vinyl chloride monomer (VCM) analysis by gas chromatography are studied. The GC analysis was conducted using a tricresyl phosphate column. Nitrogen gas with 10 ppm VCM was prepared using a borosilicate glass bottle and a pyrex syringe which were wrapped with aluminum foil. The VCM in these bottles were determined up to 4.5 hr after sampling. Approximately 95% and 70% of the initial VCM were determined after 4.5 hr in the borosilicate glass bottle and pyrex syringe respectively. N effect of UV radiation was observed for up to 3 hr exposures of sample bottles to UV radiation. The borosilicate glass bottle containing 10 ppm VCM was kept at 50 C for 3 hr and the VCM concentration of the bottle did not change. Within experimental error, the VCM analysis could be made within 4.5 hr after the sampling if a borosilicate glass bottle was used; however, the analysis should be made within 1.5 hr if a pyrex syringe is used and the adsorption of VCM onto the syringe increases after 1.5 hr, causing a larger determination error.

52372 **APTIC NO. 74950**

Ishii, T.

TRACE ANALYSIS OF ENVIRONMENTAL POLLUTANTS. *(Kankyo osen busshitsu no toresu anarishisu). Text in Japanese. Mizu shori Gijutsu (Water Purif. Liq. Wastes Treat.), 15(12):1145-1158, Dec. 1974. 30 refs.*

The application of mass spectrometry to the trace analysis of environmental pollutants is described. Parabolatype mass spectrographs, velocity-focusing mass spectrographs, and single-focusing mass spectrometers are reviewed and compared with the much more sensitive spark source type. Spark source mass spectrometry presses nonogram sensitivity. It is capable of analyzing several elements simultaneously and with less matrix effect than with simpler spectra. Therefore, it is suitable for trace analyses of environmental pollutants.

52373 **APTIC NO. 74416**

Ito, K., T. Ito, and K. Inamiya

MEASUREMENT OF AIR POLLUTANTS USING SATELLITE. *(Jinko eisei o mochiita taiki osenbutsu no sokutei). Text in Japanese. Preprint, Aeronautics and Space Technological Lab. (Japan), 4p., 1974. 8 refs. (Presented at the Space Science Technology Conference, 18th, Oct. 21-22, 1974.)*

Detection limits for nitrogen dioxide, sulfur dioxide, and ozone absorption techniques by via satellite remote sensing are calculated. The hypothetical satellite carries a detective system for a laser beam generated from ground stations. The calculation involves the altitude of the satellite (1000 km), the field angle of the detection system (zero deg), the background intensity from the earths surface, the absorption cross section, the efficiency of the optical system, the absorption of other compounds during wavelength measurements, the width of the lasing wavelength, the laser beam output and laser beam diversing angle. When a carbon dioxide laser (1 watt output and 0.02 micron width of lasing line) is used for ozone absorption at 9.6 micron, the detection limit for ozone is 1.3 ppb, assuming an abosrption cross section of 4.0 times the nineteenth power of ten sq cm and a detector sensitivity of ten raised to the -9 power. Similar calculations are made for NO2 at 0.45 micron and SO2 at 0.3 micron at different conditions, and give 3.6 ppb and 114 ppm, respectively.

52374 **APTIC NO. 74514**

Iwasaki, Yasushi

SAMPLE TREATMENT METHOD FOR ENVIRONMENTAL CONTROL ANALYSIS BY FLUORESCENCE X-RAYS. *(Keiko X-sen ni yoru kankyu kanri bunseki no tame no shiryo shoriho). Text in Japanese. Preprint, Japan Spectroscopical Society, p. 38-42, 1974. 27 refs. (Presented at the Japan Spectroscopical Society Summer Seminar, 10th, Nagano, Japan, Aug. 6-9, 1974.)*

Sample treatment for fluoresence X-ray analysis of pollutants in water, soil and suspended particulates is discussed. The primary purposes of sample treament are to increase the signal/noise ratio and to reduce the matrix effect. Precipitation, ion exchange, and solvent extraction are common preparation methods. Sulfide precipitation, fluoride precipitation, reduction to the metallic state, precipitation with organic reagents, and adsorption precipitation are described. The precipitating agents, precipitation conditions, and type of element suitable for a given precipitation method are also discussed. For microamounts of copper, iron, manganese, nickel, lead, zinc and cadmium in water, the ion exchange method is used. The procedure and type of ion exhange resin are described. The solvent extraction method can be used for the selective extraction or simultaneous extraction multi-component mixtures by using a suitable solvent. Types of solvent and treatment procedures after the extraction are discussed. The preparation of a calibration curve for the analysis of suspended particulates collected on a glass fiber filter is also described.

52375 **APTIC NO. 74334**

Katsumata, Susumu, Takayuki Okumura, Masaki Akiyama, and Kokyu Kato

ENVIRONMENTAL POLLUTION MONITORING TELEMETRY SYSTEM. *(Kankyo osen joji kanshi teremeta shisutemu). Text in Japanese. Nat. Tech. Rep. (Matsushita Electr. Ind. Co., Osaka), 20(5):601-620, Oct. 1974. 2 refs.*

Environmental monitoringg telemetry systems for air, water, and sea pollution are described. Data from monitoring stations are gathered via telemetry and are compared with various pollution reference value which are displayed by an on-line, real-time process. Simultaneous communications which issue commands regarding the pollutant source and compile statistics are also performed. The air pollution monitoring network installed in Tokushima is described in terms of specifications, the telemetry system, access 1mode, transmission control sequence, pollution monitors, the central processing unit, the circuit control unit, the monitoringg panel, a failure detection unit, and the simultaneous command receiver. System software and general processing procedures are also discussed.

52376 **APTIC NO. 74524**

Kawamura, Takeshi

OBSERVATION OF BACKGROUND AIR POLLUTION. *(Pakku guraundo taiki osen no kansoku). Text in Japanese. Kisho Kenkyu Noto (Meteorol. Study Note), no. 118:113-122, Feb. 1974. 21 refs.*

The present status of background air pollution observations worldwide is surveyed. The necessary conditions to be met in the location of baseline air pollution stations are listed. Namely, the station must be in an area where there is a minimum of contamination problems from other pollution sources, and where land use should not change drastically over a 50-year period. Regional air pollution stations should be located in a sufficiently rural environment where the effects of pollution from built-up areas are minimal. A listing of baseline and regional stations is included. In Japan a background air pollution monitoring station is scheduled to be built on Mt. Fuji. Since the amounts of heavy metals, lead, sulfur oxides, and nitrogen oxides, in the atmosphere are minute at the background level, initial worldwide pollution observations should be concentrating on the analysis of CO2, atmospheric turbidity, and precipitation components. Precipitation analysis has a long history, and is a good indication of the extent of spread of pollution. Remote sensing devices, such as artificial satellites and laser beams, and more recently, the correlation spectrometer and the nephelometer, are useful. Of these, satellites promise much for the future.

52377 **APTIC NO. 74398**

Kurumiya, Hiroyuki

DETERMINATION OF ATMOSPHERIC OZONE CONCENTRATION BY RUBBER RING TECHNIQUE. *(Gomu ringu ni yoru taiki chu no ozon nodo sokutei ni tsuite). Text in Japanese. Nihon Kankyo Sokutei Kyokai Nyusu (J. Japan Environ. Meas. Assoc.), no. 9:17-25, 1974. 20 refs.*

A relatively simple and inexpensive analytical technique for determining atmospheric ozone is described that uses rubber rings sized 32 mm in diameter and 1 mm in thickness. The elastic force of rubber rings decreases after exposure to ozone, and the deteriorated elastic force reflects the ozone concentration by comparison with the force of unexposed rubber rings. Only a simple balance is necessary to measure the decreased force. The detection limit of ozone by this method is about 4.0 pphm (1 week of exposure of the rubber rings); it can be improved by using a more precise balance. Measurements of oxidant levels in Tokyo with the present method and the potassium iodide method for 4 mo showed good agreement. The reliability of the rubber ring method for ozone determination is + or - 0.6 pphm; this can be improved when better and uniform quality rubber rings become available.

52378 **APTIC NO. 74885**

Kusuya, Yoshikazu and Kiyoshi Igarashi

STUDIES ON CONTINUOUS ACID-EXTRACTION METHOD IN ANALYSIS OF AIRBORNE METALS. *(Taiki fuyu funjin chu no kinzoku seibun bunseki ni okeru renzoku chushutsu ho no kento). Text in Japanese. Nihon Kankyo Eisei Senta Shoho (Bull. Japan Environ. Sanit. Cent.), no. 1:26-28, Dec. 1974.*

An extraction technique for airborne samples for atomic absorption spectrometry is described. The new technique uses a continuous extraction in a closed extraction apparatus in which the filter is placed in a glass holder and fresh acid solution washes the sample out into a receiving flask. The acid solution is evaporated from the flask and the fresh acid solution is continuously recirculated between the sample and flask making the continuous extraction. A standard atmospheric sample was treated by both the continuous extraction method and the conventional method and analyzed by atomic absorption spectrometry for iron, nickel, copper, cadmium, and lead. The continuous extraction method gave about 5% higher metal values than the conventional extraction method if extraction was carried out for more than 2 hr. The metal did not dissolve further when the extraction time was increased beyond 2 hr. When the airborne sample was analyzed at a different lab using the same procedure, the analytical precision was comparable to that obtained by the conventional extraction procedure. The precision obtained for copper and lead analyses was 3.6% and 2.0% respectively by continuous extraction, while the precision by the conventional method was 2.0% and 2.6% for copper and lead analyses respectively. Continuous extraction was advantageous since the condensation time required was shortened to 4 to 6 hr from the 10 to 15 hr required by the conventional technique, and also the time for the filtration and washing processes was greatly shortened. The amount of acid solvent required in the continuous extraction method was 30 ml/sample (it was 110 ml/sample in the conventional technique). Since the extraction could be made in a closed system, metal evaporation into the laboratory atmosphere could be prevented.

52379 **APTIC NO. 74354**

Liyv, Reet, R. Ott, P. Luyga, and Valentina Pikkov

CUMULATIVE MEASUREMENT OF SULFUR DIOXIDE AND FLUORIDES IN AMBIENT AIR. *(Kumulyativnoye opredeleniye dvuokisi sery i ftoridov v atmosferom vozdukhe). Text in Russian. Izv. Akad. Nauk Est. SSR, Khim. Geol., 23(3):208-213, 1974. 17 refs.*

A method for the cumulative sampling and determination of ambient sulfur dioxide and fluorides in a given sample is described. Sulfur dioxide and fluorides are sampled by means of potassium carbonate-impregnated filter papers exposed at 4 m altitude. Sulfates are determined by precipitation with benzidine hydrochloride and subsequent alkaline titration in the presence of phenolphthalein. Fluorides in the same sample are determined colorimetrically at 618 nm by means of a lanthanum alizarine complex.

52380 **APTIC NO. 74958**

Matsuda, H.

SIMULTANEOUS ANALYSIS OF GASEOUS AND PARTICLE SULFUR IN THE ATMOSPHERE BY FLUORESCENT X-RAY ANALYSIS. *(Taikichu kitaijo oyobi ryushijo iwo no keiko X-sen bunsekiho ni yoru doji bunseki). Text in Japanese. Osaka-furitsu Hoshasen Chuo Kenkyusho Dayori (Rep. Radiat. Cent. Osaka Prefect.), 15(8):5-8, Nov. 1974. 6 refs.*

Sulfur trioxide was analyzed by the usual method. A small percentage of sulfur trioxide from sulfur dioxide was absorbed by floating particles of sulfuric acid mist and could not be analyzed by the usual alkali wet filter. Instead, contaminated air was passed through a membrane filter and SO3 particles were caught on the filter. The SO2 in penetrating gas was absorbed by an alkali wet filter. A fluorescent X-ray analysis was done simultaneously on the SO2 gas and SO3 particles.

52381 **APTIC NO. 74414**

Matsushita, Hidetsuru

CHROMATOGRAPHY OF CARCINOGENIC SUBSTANCES IN ENVIRONMENT: POLYNUCLEAR AROMATIC HYDROCARBONS. *(Kankyo chu hatsugan bushitsu no kuromato gurafi: takan hokozoku tanka suiso* *no bunseki o chushin to shite). Text in Japanese. Preprint, Japan Pharmacological Society, p. 18-22, 1974. (Presented at the Japan Pharamcolgocial Society, 18th Kanto Regional Meeting, Tokyo, Paper 2,18021.)*

The analysis of polynuclear aromatic hydrocarbons, including sampling, extraction, separation, and identification, is described. Various methods for each operation are given in tabular form. For efficient analysis, a suitable combination of operations is selected depending on the analysis purpose, sample properties and condition, and the accuracy requirement. The most commonly used separation methods are column and thin- layer chromatography; high-speed liquid chromatography is potentially important. Procedural descriptions of relatively new methods of double-layer secondary (2-2) thin-layer and double-layer primary (2-1) chromatography and high-speed liquid chromatography are given with measurement data. Suspended particulates collected from urban air are analyzed by vacuum sublimation, 2-2 thin-layer chromatography, and ultraviolet irradiation. Out of 50 spots separated, 30 types of polynuclear aromatic hydrocarbons are identified. By 2-1 thin layer chromatography, eight to 12 types of polynuclear aromatic hydrocarbons are readily separated. The characteristics of high-speed liquid chromatography are discussed and compared to other chromatographic procedures, with experimental data being given.

52382 **APTIC NO. 74397**

Mishima, Hideo, Norio Kawahara, and Shozo Yano

THE PRESENT CONDITION OF THE MEASUREMENT OF PARTICULATE IN ATMOSPHERE. *(Taiki-chu ryushijo busshitsu no shitsuryo sokutei ni okeru genjo). Text in Japanese. Keiryo Kanri Keishoko Keiso (J. Instrum. Control Assoc., Japan), 23(10):27-34, Oct. 1974. 11 refs.*

The present status of measurement methods for atmospheric particulates is reviewed in terms of specific measurement devices, concentration measurements, and particle size distribution measurements. The significance of mass measurement as a criterion for concentration measurement is discussed with reference to known absolute and relative measurement methods and instruments. Particle size distribution is measured by weighing samples separated according to the particle size or by optical response techniques. The relationship between separatory sampling methods and balances used for measurements are also discussed. Various balances used for weighing filters and sampling tubes are described, with structural diagrams being provided. Descriptions of balances used for mass measurement are also given along with measurement principles, procedures, and measurement ranges.

52383 **APTIC NO. 74961**

Mori, O.

THE MAIN ASPECTS OF SMOKE MEASUREMENT AT THE ORIGINAL SOURCE OF GENERATION. *(Hasseigen ni okeru baijin sokutei jono mondaiten). Text in Japanese. Nihon Kankyo Kyokai Nyusu (Japan Environ. Meas. Chem. Anal. Assoc. News), vol. 1974:21-25, Oct. 1974. 12 refs.*

Measurement methods, position of measurement, point and time of measurement, temperature of measurement, and an apparatus for removing solid-particles from exhaust are reviewed in relation to the micro-analyses of contaminants in the atmosphere. A comparison of the relative value process and the absolute value process, the latter of which is an official measurement process. Methods for obtaining the accurate mean value of smoke are described.

52384 **APTIC NO. 74904**

Nagashima, Tsunekazu, Tomohiko Ishiguro, Takashi Hasegawa, and Yoshihiro Shigeta

GAS CHROMATOGRAPHIC ANALYSIS OF CARBONYL COMPOUNDS IN AMBIENT AIR. *(Gasu kuromatogurafi ni yoru taikichu arudehido rui no sokutei hoho no kento). Text in Japanese. Nihon Kankyo Eisei Senta Shoho (Bull. Japan Environ. Sanit. Cent.), no. 1:54, 1974.*

Determination of carbonyl compounds was achieved by gas chromatography using 2,4-dinitrophenylhydrazone (2,4-DNPH). Carbonyl compound vapors were absorbed by the 2,4-DNPH solution, which was extracted into 10 ml of carbon tetrachloride. The 2,4-DNPH derivatives were then analyzed by gas chromatography with a flame ionization detector. The extraction efficiency was nearly 100% if 100 micrograms of formaldehyde, acetoaldehyde, propionaldehyde, or n-butylaldehyde was added to the absorbing solution. From 92 to 93% of 1 mg acetoaldehyde could be extracted when the extraction was made twice. The carbonyl-DNPH derivatives existed in more stable forms when they were extracted into carbon tetrachloride. No loss of the extracted carbonyl-DNPH derivatives was observed for 5 days after the extraction, while less than 1% of the carbonyl-DNPH derivatives were lost after 3 days of reactions; for formaldehyde and acetaldehyde no loss was observed and 100% of the derivatives were retained in the absorption liquid. The method was applied to detect carbonyls in the ambient air near a petrochemical industry center. A few ppb level of formaldehyde, acetoaldehyde, and acetone were detected in the ambient air with 10% precision.

52385 **APTIC NO. 74892**

Nagata, Yoshio, Yoshihiro Shigeta, and Norihumi Takeuchi

FIELD SURVEYS BY SIX GRADES ODOR INTENSITY METHOD IN ODOR POLLUTED AREAS; (1) THE CORRELATIONS OF RESPONSES AMONG PANELS. *(Yagai chosa ni okeru shuki kyodo hyoji ho no kento, 1, paneru kan no oto no sokansei). Text in Japanese. Nihon Kenkyo Eisei Senta Shoho (Bull. Japan Environ. Sanit. Cent.), no. 1:63, Dec. 1974.*

The correlation of odor sensing by the human nose between trained and untrained panels was measured statistically. The panel members were stationed at different distances leeward from a kraft pulp factory and a fish meal plant and asked to indicate their sensed odor by six grades of odor intensity. Trained panels and untrained panels were stationed at each sensing location and reported the results of their sensory test every 10 sec for 30 min, from which the correlation of responses between trained and untrained panels was determined. Both panels responded similarly when sensing an intermittent odor, especially when the variation of odor intensity with time was great. The reported intensities were not the same for the trained panel and untrained panel although within each panel the reported odor intensity was similar.

52386 **APTIC NO. 74381**

Naruse, Tetsuo and Hironobu Kajii

STUDIES ON MEASUREMENT OF TOTAL RADIATION RATE IN THE NORMAL DIRECTION IN THE INFRARED REGION. *(Sekigai ryoiki ni okeru hosen hoko sogo fukusharitsu no sokutei ni kansuru kenkyu). Text in Japanese. Kinki Daigaku Kogai Kenkyusho, Kenkyu Hokoku (Kinki Univ. Pollut. Res. Inst. Rep.), vol. 2: 117-121, Oct. 1974.*

A study of the techniques of measurement of total infrared radiation rate in the normal direction is reported. To study such parameters, a sample box which eliminates strayed radiation from surroundings was constructed and spontaneous infrared radiation from different materials was studied by use of an infrared pyrometer (Barus Co., PRT-5). The range of detection of this meter is 8-14 micron. Radiation from aluminum, black rubber, plastic tile, plywood, slate, and linoleum were observed. The emissivity of each of these samples at room temperature (24.5 C) is 0.039, 0.708, 0.901, 0.890, 0.915, and 0.945 respectively.

52387 **APTIC NO. 74704**

Nogami, Y., T. Moriwake, and K. Fujisawa

SYSTEMATIZATION OF ATMOSPHERIC HEAVY METAL MEASUREMENT BY X-RAY FLUORESCENCE METHOD; MEASURING METHOD FOR SUSPENDED PARTICULATE IN AIR, PART 1. *(Keiko X-sen bunseki ni yoru taikichu no jukinzoku sokutei no sisutemu ka ni tsuite, taikichu no fuyu funjin no sokutei hoho ni kansuro kento, dai 1-ho). Text in Japanese. Okayama-ken Kogai Boshi Center Kenkyu Hokoku (Bull. Okayama Prefect. Pollut. Control. Cent.), 2(1):1, 1974.*

An automated X-ray fluorescence technique for airborne dust analysis was developed. Airborne dust was collected on a 0.8 micron millipore membrane filter which was used as the X-ray sample. Calibration curves for lead, zinc, nickel, iron, and manganese were prepared by precipitating these metals on the membrane filter, and a linear calibration curve up to 100 micrograms was obtained for all metals, from which the response factor of the fluorescence intensity for each metal could be obtained. The use of a mini-computer would make this system suitable for automated metal analyses of airborne dusts both quantitatively and qualitatively. The technique is non-destructive and no preliminary sample treatment is necessary, therefore rapid analyses can be made if airborne dust is trapped on the filter. Glass filters are not recommended for use because of the metal impurities in the filters.

52388 **APTIC NO. 74448**

Oshima, Tsugukage

STANDARD GAS PRODUCTION DEVICE FOR POLLUTION MEASUREMENT EQUIPMENT. *(Kogai keisokuyo hyojun gasu hassei sochi). Text in Japanese. Oyo Butsuri (Tokyo), 43(5):518-520, 1974. 16 refs.*

Standard gas is necessary for the determination of scale and routine correction of measuring apparatus. Standard gas is used to set the lowest and highest scales and between the two, enough points for accurate measurement. It is also used to check the accuracy of the scales daily, weekly, monthly, or annually. In preparation of a mixed gas from more than 2 components, weight ratio, volume ratio, pressure ratio, or flow ratio mixing is employed. Gas can be produced by the static method, by which gas is prepared and stored in a container, or by the kinetic method, by which gas is prepared at the same time it is used. The former includes the direct method, substitution method, high pressure container method, and low pressure container method, while the latter includes the flow rate ratio method, volume ratio method, permeation method, photochemical reaction for ozone, vapor pressure method for benzene and water vapor, electrolytic method for oxygen and hydrogen, and the conversion method for nitrogen oxides. A combination of static and kinetic methods is also common.

52389 **APTIC NO. 74960**

Ota, T., K. Makino, and K. Mizokuchi

ANALYSIS OF ORGANIC COMPOUNDS IN AIR (1). ANALYSIS OF CHLORINATED HYDROCARBONS. *(Taikichu no yukikagobutsu no bunseki (Dai-ippo) Ensokei yukiyozai ni tsuite). Text in Japanese. Tokyo-toritsu Eisei Kenkyusho Kenkyu Nenpo (Ann. Rept. Tokyo Metrop. Res. Lab. Public Health), no. 25:347-354, Aug. 1974. 17 refs.*

Experiments with chlorinated hydrocarbons were conducted as part of an analysis of organic compounds in photochemical smog. An air sample was concentrated with Kato s odor concentration apparatus and then analyzed by gas chromatography with a hydrogen flame ionization detector (FID) and by gas chromatography-mass spectrometry method (GC-MS). Organic chloride compounds such as chloroform, trichloroethene, tetrachloromethane, trichloroethylene, perchloroethylene, methylenechloride, and dichloroethane were detected in the atmosphere of Tokyo with a gas chromatograph with an electron capture detector (ECD).

52390 **APTIC NO. 76730**

Peralma, Rameu, and Jolliot

A NEW NETWORK OF ELECTRICITE DE FRANCE FOR STRONG ACIDITY MONITORING IN THE PARIS REGION. *(Un nouveau reseau E.D.F. pour la surveillance de l acidite forte de l air dans la region parisienne). Text in French. Pollut. Atmos., no. 64:405-421, Oct.-Dec. 1974.*

The new sulfur dioxide monitoring network of Electricite de France in the Paris region is described, and preliminary results of concentration monitoring are presented. The monitoring stations, including SO2 monitors, and instruments for the measurement of the wind speed and wind direction, are distributed within and around Paris according to the dominant wind directions. The measurement data are transmitted to a computer center for immediate evaluation and alarm release and for statistical processing. The alarm threshold is set at 600 micrograms/cu m as an hourly mean. An alert is released whenever the readings of three monitoring stations exceed 600 micrograms/cu m for at least 1 hr at wind speeds below 2 m/sec. An alert is also released when the stations along the axis of flue gas plumes show readings over 600 micrograms/cu m for more than 1 hr at wind speeds over 2 m/sec. An alert is called off when these two conditions are not satisfied for at least 1 hr. Preliminary results show good correlation between temperature and SO2 emissions, and a considerable contribution of domestic heating emissions to the overall SO2 level.

52391 **APTIC NO. 74353**

Pikkov, Valentina and P. Luyga

CUMULATIVE DETERMINATION OF CARBON MONOXIDE. *(Kumulyativnoye opredeleniye okisi ugleroda). Text in Russian. Izv. Akad. Nauk. Est. SSR, 23(3):261-263, 1974. 5 refs.*

A method for the cumulative determination of carbon monoxide in the air is described. The method is based on the reduction of palladium chloride to metallic palladium by CO. Whatman chromatographic paper Number 540, wetted with acetate buffer solution (pH 5.8), is used for the determination. The test paper is then dried and immersed in 0.2-5% aqueous palladium chloride and 10% glycerine. The treatment with the buffer solution increases the uniformity of the test paper sensitivity during exposure, while glycerine increases the sensitivity at low temperature and low humidity conditions. Increased palladium chloride concentrations are best at low humidity. The test strips are placed into a flask, and the CO concentration in the air samples is determined from the blackening of the paper.

52392 **APTIC NO. 74318**

Schwabe, Kurt

PROCESS CONTROL IN ENVIRONMENTAL PROTECTION. *(Prozesskontrolle im Umweltschutz). Text in German. Preprint, Forschungsinstitut Meinsberg, Meinsberg (German Democratic Republic), 12p., 1974. 8 refs. (Presented at the Process Engineering Annual Conference, Dresden, German Democratic Republic, 1974.)*

Electrochemical methods for recording pollutant concentrations in air and water are described. Gaseous air pollutants, such as sulfur dioxide, hydrogen sulfide, carbon monoxide, chlorine, hydrochloric acid, and nitrogen oxides can be coulometrically determined from the quantity of electric charge necessary for the oxidation or reduction at a sensitivity limit of 0.01 ppm. One apparatus used for the determination of SO2 concentrations in East Germany uses a measuring cell filled with potassium bromide and sulfuric acid. The SO2 is oxidized by anodically generated bromine, and the bromine excess is indicated by indicator electrodes and is used for the control of the generator current which is proportional to the SO2 concentration. The instrument indicates both the instantaneous value and time-integrated values for periods of up to 15 min.

52393 APTIC NO. 74836

Shiomi, K.

COMPOSITION ANALYSIS OF ATMOSPHERIC HYDROCARBONS BY GAS CHROMATOGRAPHY. *(Gas chromatography ni yoru taikichu tanka suiso no sosei bunseki). Text in Japanese. Shimazu Kagaku Kiki News (Sci. Instrum. News), 15(6):12-14, Dec. 1974. 2 refs.*

Airborne hydrocarbons were collected with a U-tube trap packed with diatom earth and cooled with liquid oxygen. The trap was then heated to 150-200 C, and the gases were introduced into a gas chromatograph with a flame ionization detector. A column (3 mm by 6 m) was packed with 25% Apiezon-L on Shimalite (60/80 mesh) for the analysis of hydrocarbon in general, and a column (3 mm by 3 m) was packed with 25% BCEF on Shimalite (60/80 mesh) for the analysis of aromatic hydrocarbons only. For the analysis if two to four carbon hydrocarbons, the column was packed with 1% Squalene on activated carbon (60/80 mesh). Satisfactory separation of such aromatic and aliphatic hydrocarbons as benzene, toluene, ethylbenzene, diethylbenzene, ethylene, ethane, propylene, propane, butane, and butenes.

52394 APTIC NO. 74468

Suzuki, S.

ANALYTICAL TECHNIQUES FOR THE STUDY OF PHOTOCHEMICAL SMOG, PRESENT AND FUTURE. *(Kokagaku smog kenkyu ni okeru bunseki gijutsu no genjo to kongo no kadai). Text in Japanese. Shimazu Kagaku Kiki News (Sci. Instrum. News), 15(5):1-5, Dec. 1974.*

A general discussion is given on photochemical smog measurement techniques. The Saltzman method uses a mixed solution of N-(1-naphthyl)ethylenediamine dihydrochloride, sulfanilic acid, and acetic acid to absorb nitrogen dioxide and the absorbance of the resulting color solution is measured near 545 nm. The chemiluminescence method utilizes the chemiluminescent reaction between nitric oxide and ozone for the determination of NO. Both methods require the conversion of one nitrogen oxide into the other. The flame ionization detector has been the most popular method for analyzing hydrocarbons in recent years. Methane and non-methane hydrocarbons must be analyzed separately. A method developed at the Shimazu Co. uses a column to separate methane groups from non-methane groups and a second column to separate methane from other gases. Oxidants and O_3 are analyzed by the potassium iodide method and chemiluminescence method, and total aldehydes are analyzed by the 3-methyl-2-benzothiazoline hydrazone (MBTH) method. Gas chromatography with an electron capture detector has been actively used in peroxyacetyl nitrate analysis. Other methods including infrared, ultraviolet, and mass spectrometry and nuclear magnetic resonance are also used for the analysis of this compound.

52395 APTIC NO. 74568

Tachibana, Keisuke

CHEMICAL ANALYSIS METHODS FOR NITROGEN OXIDES IN FLUE GASES. *(Haigasuchu no chisso sankabutsu no kagaku benseki hoho). Text in Japanese. The Japan Assoc. for Thermal Energy Technology, 9p., 1974. (Presented at the Japanese-American Symposium on NOx countermeasures for Stationary Sources, Tokyo, Japan, June 28-29, 1974.)*

The analysis of nitrogen oxides in flue gas is discussed. Important considerations in NOx analysis are: accurate sampling of the test material gas, the retention of NOx in the absorbent in the form of nitrite or nitrate, and, the quantitation of NO_2 and NO_3 in the absorbent. Of these three, the second is the most important and difficult. The phenoldisulphon method utilizes the reaction of PDS with nitric ion produced by oxidation-absorption of NOx in the test gas. The method is suitable for concentrations of 10-200 by volume. A quick PDS method is designed to shorten the oxidation time and is suitable for 50-1000 ppm by volume. For both methods, dilution of the test material by water is possible. The nitric acid ion electrode method first oxidizes NOx by ozone and then ionizes it in an oxidized absorbent. The concentration of NO_3 is measured by nitric acid ion electrodes. The method is suitable for 50-1500 ppm by volume. The zinc reduction NEDA method causes NOx ionization in ozone. Using metal zinc power, NO_3 is reduced to NO_2 and a reaction between sulphanylamide and naphtylethylenediamine causes coloration which is measured. This is suitable for NOx concentrations of 10 to 1000 ppm. For the measurement of nitrogen dioxide only, the Saltzman colorimetric method is appropriate. It is suitable for 5-50 ppm concentration.

52396 APTIC NO. 76654

Tanada, Yoshihiro, Mamoru Chiba, and Yasuhide Kusano

AN ANALYTICAL METHOD FOR POLLUTED GAS BY LASER. *(Reza ni yoru osen gasu bunseki no ichihoshiki). Text in Japanese. Preprint, Inst. of Electrical Engineers of Japan, Tokyo, p. G35, 1974. (Presented at the Institute of Electrical Engineers of Japan, Kansai Branch Meeting, Kyoto, Japan, Nov. 1974, Paper G2-1.)*

The instrumental set-up for Laser Raman Scattering pollution analysis is described. A strong laser beam is necessary for Raman scattering and a Q switch Nd-YAG laser can be used. The wavelength of the laser is 0.532 micron and the output is 92.5 W per pulse. The laser beam enters a scattering cell and the light scattered by pollutants is collected by a mirror and concave lens on a monochrometer and detected by a photomultiplier whose signal is amplified by a pre-amplifier before being counted by a photon counter. The photon counter is synchronized with the laser pulse. This is done by using the laser beam at the end of the scattering cell, and the laser beam is detected by a power detector which is connected to a gate time generator. The gate time generator can also adjust the delay time accompanying the electronic system.

52397 APTIC NO. 74555

Taniguchi, Naozo

THE PRESENT STATE OF STACK GAS NOX METERS. *(Endo haigasuyo NOx kei no genjo). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(8):49-53, Aug. 1974.*

Information on the commercially available nitrogen oxides meters for stack gas is compiled. The types of NOx meter are classified into infrared absorption, chemiluminescence (atmospheric pressure and reduced pressure), ultraviolet absorption (two-wavelength spectrometry and correlation spectroscopy), and electrolytic method, and their general characteristics are discussed. The performances of each NOx meter are described in terms of the measurable component, measurement range, measurement procedure, use of converter, reproducibility, stability (zero drift and span drift), temperature characteristics, pressure and flow rate characteristics, maintenance, and effect of interfering components. The converter still has unsolved problems of deterioration in catalyst activity and conversion of ammonia to nitric oxide. The presence of mist in sample gas is another problem affecting the stability of NOx meters. Manufacturers of NOx meters are listed.

52398 APTIC NO. 74347

Tsuchida, Shigeji, Korehito Ota, and Kazuhiko Yoshii

AN ALL-AROUND MONITORING SYSTEM FOR ENVIRONMENTAL POLLUTION BY AKITAA PREFECTURES ADMINISTRATION. *(Akita-ken no kogai sogo kanshi shisutemu). Text in Japanese. Denshi Gijutsu (Electron. Technol.), 16(11):2-8, Nov. 1974. 1 ref.*

An all-around monitoring system for environmental pollution in Akita prefecture is described. The system includes: water and air quality monitors, a central data processing system, a data correction system, and a graphic display unit. A description of the systems organization is presented. A digital telemeter is used to transmit and receive information: A computer in the process functions in terms of on-line jobs and background ones. These two major jobs are classified into smaller tasks which are administered by an operating system.

1973

52399 **APTIC NO. 76717**

Benova, Eva

USE OF LIQUID CHROMATOGRAPHY FOR MEASURING ATMOSPHERIC SULFUR DIOXIDE AND NITROGEN OXIDE. *(Vyuziti plynove chromatografie pro stanoveni kyslicniku siriciteho a kyslicniku dusiku v ovzdusi). Text in Czech. Ochrana Ovzdusi, 5(2):31-32, Feb. 1973. 16 refs.*

A literature search to ascertain the applicability of liquid chromatography to the analysis of atmospheric sulfur dioxide and various oxides of nitrogen is reported. Simple or enriched samples can be analyzed. Plastic bags are recommended for preparation of simple samples; and a table of 18 plastic materials, their manufacturers, and pollutants to which they are inert is provided. Enriched samples can be prepared in chromatographic columns by adsorption methods. Tables are provided listing carriers, stationary phase materials, temperatures, carrier liquids (helium or nitrogen), column dimensions, and other data recommended for chromatographic tests of SO2 and NOx. Because of its reactivity and tendency to polymerize, sulfur trioxide should be reduced to SO2 prior to analysis.

52400 **APTIC NO. 76698**

Hay, D. R.

SOME RECENT LIDAR EXPERIMENTS ON PARTICLE SCATTERING IN THE LOWER TROPOSPHERE. *Preprint, Western Ontario Univ., London (Canada), 4p., 1973. 11 refs. (Presented at the North Atlantic Treaty Organization Advanced Study Institute, Sorrento, Italy, June 5-14, 1973.)*

The basic principles of remote sensing by lidar are reviewed along with its applications to experiments on particle scattering in the lower troposphere. The following four components are basic to lidar: the transmitter, the scattering region of the atmosphere, the receiver, and the interpreter of the lidar signature. The latter usually dictates the choice of lidar parameters, while the lidar equation relates the other three components. Pattern recognition is used to examine patterns of particulate distribution as an aid to studying thermal convection and stratification in the atmosphere. More precise information on the particulate loading of the atmosphere requires added sophistication in the lidar measurement, involving several simultaneous and independent lidar observations on the same volume of atmosphere. The use of a monostatic lidar to measure the Stokes parameters of signal scattering along the transmitted beam and the provision for simultaneous scattering at two lidar wavelengths (0.6943) and 0.3472 micron) revealed several categories of atmospheric particulates that are associated with different urban environments.

52401 **APTIC NO. 76683**

Jahn, Jiri

A CONTINUOUS CALIBRATOR OF ATMOSPHERIC SULPHUR DIOXIDE ANALYZERS WITH A RANGE OF 0-2 MG/CU M SO2. *(Kontinualni kalibrator analyzatoru SO2 v ovzdusi o rozsahu 0 az 2 mg/cu m SO2). Text in Czech. Ochrana Ovzdusi, 5(4):59-63, April 1973. 9 refs.*

A prototype calibrator for the preparation of reference mixtures of sulfur dioxide is described that utilizes the permeation of SO2 through teflon tubes. A change in the concentration of SO2 in the reference mixture of the calibrator can be achieved by changing the temperature of the calibrator or by changing the flow of the carrier liquid. The basic components of the calibrator are a steel reservoir with a connecting piece and teflon permeation tubes. This assembly is placed into the calibrator proper which ensures the correct temperature for the reservoir and the tubes, as well as that of the carrier liquid, and mixes the carrier liquid with the SO2 released from the permeation tubes. The entire calibrator is inserted into a type U3 Wobser thermostat. The SO2 concentration of the output reference mixture is determined by the length of the permeation tube, its temperature, and the flow rate of the carrying liquid. When the temperature is stabilized to within + or - 0.1 C, the permeation of SO2 varies by about 0.7% The reproducibility of SO2 concentration in the output mixture is better than 0.5%. This performance was verified by comparison with colorimetric and coulometric analyses.

52402 **APTIC NO. 76726**

Obrusnik, I. and B. Starkova

ANALYSIS OF FLY ASHES BY NEUTRON ACTIVATION ANALYSIS. *(Analyza popilku medodou aktivacni analyzy). Text in Czech. Radioisotopy, 14(3):437-447, March 1973.*

The applicability of neutron activation analysis to the identification of chemical elements in fly ash and the possibility of using this information for the identification of pollution sources were investigated. Samples of 25 ashes and ash mixtures were irradiated in a nuclear reactor together with nine reference samples. The measurements were made with a gamma spectrometer. Short half-life samples were measured at 10-18 min, 30-45 min, and 24-36 hr after irradiation. Long half-life samples were measured at 24-36 hr and 20-30 days after irradiation. The spectra were evaluated either manually or by computer. Elements discovered in ashes were: aluminum, vanadium, magnesium, calcium, manganese, sodium, potassium, arsenic, chlorine, lanthanum, bromine, copper, scandium, tungsten, antimony, cobalt, iron, cerium, chromium, zinc, thorium, cesium, barium, europium, and mercury; 20 of these were evaluated quantitatively. The identification of a pollution source by activation analysis can be made more reliable by increasing the number of samples and by maximizing the accuracy of results obtained for each sample.

52403 **APTIC NO. 76682**

Santroch, J. and I. Obrusnik

NON-DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS OF ATMOSPHERIC AEROSOLS. *(Nedestruktivni neutronova aktivacni analyza vzdusnych aerosolu). Text in Czech. Radioisotopy, 14(3):449-457, March 1973. 3 refs.*

The method of non-destructive neutron activation analysis was used to detect trace chemical elements in atmospheric aerosols at Prague-Karlov and in northern Moravia. Samples of 1-5 mg were collected by a membrane filter for gravimetric analysis of the atmospheric dust concentration. The samples were irradiated in a reactor, with short half-life radioisotopes being irradiated for 10 min and pneumatically transported to a germanium (lithium) detector with a 1000-channel analyzer. Vanadium, aluminum, chlorine, and sodium were detected. The long half-life radioisotopes were irradiated for 6 hr and were measured 30 hr or 30 days later by a semiconductor Ge (Li) detector connected to a 400-channel analyzer. Potassium, lanthanum, europium, cobalt, antimony, zinc, cerium, chromium, scandium, iron, and silver were detected from northern Moravia. The method was sufficiently accurate and sensitive for the detection of 20-30 elements in a single sample, provided that adequate measures against contamination of the samples were observed.

52404 **APTIC NO. 74710**

Sasuga, Hiroo, Toshihiro Nakamura, Masanori Fujii, and Masao Takezoe

DETERMINATION OF POLLUTANTS. *(Kogai seibun bunsekiho no kenkyu). Text in Japanese. Meiji Daigaku Kagaku Gijutsu Kenkyusho Nenpo (Ann. Rep. Inst. Sci. Technol., Meiji Univ.), no. 15:8, 1973.*

Metal analyses were studied by atomic absorption spectrometry and X-ray diffraction. Zinc, lead, cadmium, copper, nickel, and cobalt were analyzed by the atomic absorption spectrometry after methyl isobutyl ketone extracti 74711 PRESENT STATUS OF CERTIFICATION OF AIR POLLUTION VICTIMS WITH HEALTH IMPAIRMENT, TABULATED BY DISEASE AND MUNICIPALITY. (Taiki osen kenko shogaisha nintei jokyo, shitsubyo betsu, kushichoson betsu). Text in Japanese. Tokyo-to Eisei Nenpo (Annual Report of Public Health, Tokyo), no. 26:259, 1974. ABSTRACT A list of the muncipalities in Metropolitan Tokyo, the number of subjects (0-17 years old) examined from each area, the number of patients from this group who were certified as pollution victims, and types of respiratory diseases which they had. A total of 2,920,503 subjects were examined, 13,959 of whom had one of four kinds of respiratory diseases. There were 219 cases of chronic bronchitis, 8682 cases of bronchial asthma, 5057 cases of asthmatic bronchitis, and 1 case of emphysema. More than half of these cases were found in Tokyo. In the Ota Ward in Tokyo City there were 771 cases of bronchial asthma and 746 cases of asthmatic bronchitis. In the Setagaya Ward in Tokyo City there were 665 cases of bronchial asthma and 391 cases of asthmatic bronchitis.

52405 **APTIC NO. 74533**

Suzuki, Shin and Nobutoshi Horiuchi

REEXAMINATION OF THE ACROLEIN ANALYSIS METHOD BY 4-HEXYLRESORCINOL. *(4-hekishirurezorushinoru-ho ni yoru akurorein bunsekiho no saikento). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Environ. Sci. Res. Rep., Chiba Univ.), 1(1):103-109, July 1973. 3 refs.*

In general, 4-hexylresorcinol has been the reagent of choice for quantitative determination of acrolein in the environment. The process has high sensitivity, but is not affected by the concentrations of sulfur dioxide, nitrogen dioxide, oxygen, and organic matter present in the atmosphere. However, results vary markedly according to the procedures used in the analysis, even in such matters as the order in which 4-hexylresorcinol, HgCl2, and trichloroacetic acid are added before absorption data are taken. Temperature of treatment and exposure to sunlight also affect results. For more consistent results the heating temperature should be 40 C and the heating time 25 min. (Author abstract modified)

52406 **APTIC NO. 74998**

Tomizawa, Toshi

DETERMINATION OF MICROAMOUNTS OF SULFUR TRIOXIDE IN ATMOSPHERE (PART 2): DETERMINATION OF SULFURIC ACID AEROSOL. *(Taiki osen seibun to shite no san sankaiou no sokuteiho (Sono 2): Ryusan misuto no sokutei ho no kento). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab., Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 72093:1-25, July 1973. 10 refs.*

Sulfuric acid mists were collected by using fiber glass filter (GF/F, 55 mm inside diameter), millipore filter (pore size 0.8 microns), nuclepore membrane filters (pore size 0.8 microns), Toyo filter papers no. 1 and no. 5C, and silica wool. The filter paper holder was connected to a cascade impactor with teflon tube. The air flow rate was set at 8 l/min. The cover glass of the impactor and the filter paper were put into 30 ml deionized water which was used as the sample water. Blank solution was prepared by using clean filter paper. Barium chloride was added to the sample solution and the resulting solution was heated at 150 C while nitrogen gas was passed as carrier gas. The hydrogen chloride gas formed was analyzed by an AP meter utilizing the conductometric method. The standard deviation of this method with standard sample was less than 10%, and the sensitivity was 2.5 micrograms of H2SO4 per sample. No interference by ammonium sulfate was observed. The method also gave better results than a conventional decomposition-reduction method.

52407 **APTIC NO. 74784**

Umeda, H.

STUDY ON CHROMOTROPIC ACID PROCESS FOR FORMALDEHYDE QUANTITATIVE ANALYSIS. *(Horumu arudehido teiryo no tame no kuromotoropusan-ho no kento). Text in Japanese. Hyogo-ken Kogai Kenkyusho Kenkyu Hokoku (Rept. Public Nuisance Res. Inst. Hyogo Prefect.), no. 5:52-53, Nov. 1973. 5 refs.*

As an analytical procedure for determining formaldehyde (HCHO) in the atmosphere, the appliance of chromotropic acid to HCHO absorption in 1% sodium sulfite solution has many features as safety, stability, and selectivity, but the sensivity of the Na2SO3 process is inferior to that of the concentrated sulfuric acid solution process with chromotropic acid. The optimum H2SO4 concentration for absorption of chromotropic acid is given. The relationship between H2SO4 concentration and HCHO absorbancy is indicated graphically. Optimum absorbance was obtained with 3 ml of concentrated H2SO4 (68.7% concentration).

52408 **APTIC NO. 76710**

Wolff, Burkhard and Heinz Stehle

THE PORSCHE DEVELOPMENT CENTER. *(Das Porsche Entwicklungszentrum). Text in German. Automobiltech. Z. (Stuttgart), 75(2):33-38, Feb. 1973.*

An exhaust test device in Porsche racing and small cars is described and illustrated. The exhaust gas testing is done by means of 4 test boxes with casters including geared flywheel sets and hydraulic power brakes. The casters are set up on springs. In the partially air conditioned test chambers, the exhaust samplers cause the branching off of the necessary exhaust gas flow and transfer it to the analyzers in the control chamber. The toxic substances are analyzed with infrared gas analyzers according to the European and California tests or the CVS method. The hydrocarbons and nitrogen dioxide particles are determined according to the chemiluminescence method and flame ionization detection. Concentration data and vehicle speed values are recorded simultaneously. Tests conducted over 50,000 miles proved the high working efficinecy of the vehicles and their superiority from the environmental standpoint.

1972

52409 **APTIC NO. 74983**

Nagayama, T. and H. Matsuda

DEVELOPMENT OF MEASURING APPARATUS OF DUST APPARENT RESISTIVITY FOR FIELD MEASUREMENT. *(Baijin no genchi yo mikake koyu denki teiko sokuteiki no shisaku). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab., Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 72036:1-8, Aug. 1972. 11 refs.*

A simple apparatus was developed for field measurement of dust apparent resistivity. Teflon, which is heat-proof and possesses inherent resistivity, was filled between a disc electrode and a guard electrode, with the two electrodes fixed at a given distance. An absorbing nozzle was equipped on one side of the apparatus while the other side was covered with glasswool. The apparatus was simple in structure with a convertible electrode surface for different purposes. For the measurement of high apparent resistivity of large quantities of dusts, the electrode surface was increased, and for that of low apparent resistivity of small quantities of dusts, the electrode surface was decreased. This apparatus gave results in good agreement with those obtained by using a centrifugal-cylindrical electrode.

52410 **APTIC NO. 74899**

Yanagisawa, S.

SUMMING UP MEASUREMENT OF AIR POLLUTION. *(Taiko osen no sokutei o matomete). Text in Japanese. Enjiniyasu (Engineers), no. 292:16-17, Dec. 1972.*

The present situation and problems measuring air pollution in Japan are described. Progress in air pollution measurement methods is about equal in the United States and Japan, but the development of equipment is more advanced in the United States. Japan has no standard for water soluble acidic matter. Problems of low concentration correction and biased measurement figures for continuous monitoring are discussed. The measurement of dust and other particulates is also discussed. Other topics covered include: measurements of flue dust, the radiation analysis of particulates, the analysis of polycyclic aromatic hydrocarbons, and the analysis of odor components.

52411 **APTIC NO. 76691**

Environmental Analysts, Inc., Garden City, N. Y.

AIR QUALITY IN NASSAU-SUFFOLK COUNTY, N. Y. EVALUATION AND ANALYSIS OF THE LONG ISLAND LIGHTING COMPANY SULFUR DIOXIDE MONITORING PROGRAM. *124p., 1972 (?). 9 refs.*

An evaluation of Long Island Lighting Company s sulfur dioxide monitoring system is presented. The instruments measure the hourly average SO2 concentration at 11 monitoring stations in Nassau and Suffolk Counties. Hourly average meteorological data are also accumulated from three weather stations. The data bank contains about 350,000 hourly SO2 measurements and 250,000 hourly meteorological observations. The data collected by the SO2 network are accurate and generally complete. The West-Gaeke technique is used for SO2 measurements. Correlations between SO2 levels and wind data are generally reliable. There is a clear relationship between SO2 levels and heating degree days, a measure of the house heating needed on a daily basis to make up the difference between the outdoor temperature and a comfortable indoor temperature. Sulfur dioxide concentrations are higher in cold weather when more fuel is being burned for heating. There is also a correlation between SO2 readings on Long Island and exposure, either by proximity or wind effects, to SO2 from sources in the highly urbanized areas of New York City and northern New Jersey. The only significant sources of SO2 on Long Island are emissions carried by winds from New York, fuel burned for space and hot water heating, and LILCO power plants.

1971

52412 **APTIC NO. 74611**

Destremont, H.

DETERMINATION OF SULFUR DIOXIDE AND SULFUR TRIOXIDE IN FLUE GASES BY THE ISOPROPANOL METHOD. *(Dosage du SO2 et du SO3 dans les fumees par la methode a l isopropanel). Text in French. Assoc. Technique de la Siderurgie Francaise, Paris, Commission Eau et Pollution Atmospherique, Rept. E-PA 37, 5p., June 1971.*

A simple method for the separate determination of the sulfur dioxide and sulfur trioxide concentrations in flue gases by means of isopropanol is described. The flue gas sample is sent through a coil immersed in a water bath at 60-90 C and the condensed SO2 is collected on a glass frit. The adsorbed SO3 is removed by means of distilled water containing 5% isopropanol and bromophenol blue indicator by pH 4.6 for subsequent titrimetric determination of the SO3 content with a sodium hydroxide solution. The SO2 is oxidized to sulfuric acid in distilled water containing hydrogen peroxide, and is determined by a similar titrimetric method with sodium hydroxide.

AIR QUALITY MEASUREMENTS

1975

52413 **APTIC NO. 74867**

Asakino, Kunihiko, Tetsuto Komeji, Kazuyuki Aoki, and Toshio Ohira

THE RELATION BETWEEN THE POLLUTANT AND THE ELECTRIC CONDUCTIVITY OF AEROSOLS. *(Aerosol no dendodo tokusei to osenbusshitsu no kankei). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 70, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

A continuous measuring instrument for sulfur oxides was redesigned and tested. The diameter of the sampling nozzle was 2 mm. The samples were collected at a rate of 10 l/min. Measurements by electrical conductivity were made each hour. On July 4, 1974, many residents near Tokyo suffered from eye irritation during a fog episode. The curve of electrical conductivity measured between 10 pm, July 3rd and 10 pm July 4th was quite similar to the curve of sulfur dioxide concentration. The curve for the variation in nitrogen dioxide was quite different from these two curves. This tendency was also noticed for measurements made at Kogochi Dam and in Chiyoda Borough. The electrical conductivity of aerosols and rainwater and the concentration of various ions became very small in the winter. The electrical conductivity of aerosols usually increased when the concentration of sulfur dioxide increased, when the temperature and humidity were very high, and when the aerosol density was high. The high electrical conductivity of aerosols at Kogochi Dam, where the content of gaseous pollutants was low, was attributed to sulfate ions.

52414 **APTIC NO. 74585**

Baumann, R., H. Hauck, J. Schedling, A. Tallafuss, and J. Waniek

RESULTS OF CONTINUOUS SULFUR DIOXIDE MEASUREMENTS IN VIENNA FROM SEPTEMBER 1969 TO JUNE 1973. *(Ergebnisse kontinuierlicher Schwefeldioxid-Messungen in Wien von September 1969 bis Juni 1973). Text in German. Radex Rundschau (Austria), 1:303-317, April 1975. 14 refs.*

From 1969 to 1973, the sulfur dioxide concentration in Vienna was obtained continuously by recording the conductivity of an electrolyte saturated with air. The SO2 concentration in Vienna was almost completely due to commercial and domestic heating. The concentration level did not increase within the period investigated. In order to evaluate the air quality of Vienna, the recommendations of the World Health Organization and the Austrian Academy of Science, as well as the legal standards of the German Federal Republic and Japan, were used. It was shown that the hygienic standards with regard to SO2 in the city needed to be improved. The highest monthly average in the summer, 0.15 mg SO2/cu m, was measured in April 1973. In the same month, the highest summer diurnal average of 0.25 mg/SO2/cu m was measured. During the winter months, the monthly average of 0.30 mg SO2/cu m was occasionally exceeded. Combining all observed winter periods it was found that 23% of the diurnal averages were above 0.30 mg SO2/cu m.

52415 **APTIC NO. 74592**

Detrie, J.-P.

EVOLUTION OF THE STRONG ACID AND BLACK SMOKE POLLUTION IN FRANCE AND IN THE PARIS REGION. *(Evolution de la pollution acidite forte et fumes noires en France et dans la region Parisienne). Text in French. Centre Interprofessionel Technique d Etudes de la Pollution Atmospherique, Paris (France), Documentaires, no. 44:1-12, 1975 (?).*

Systematic measurements of sulfur dioxide and black smoke (particulate) concentrations in France and in the Paris region during 1973n1974 are presented. The overall pollution level showed no significant change from previous years, although a slight decrease in particulate matter and a slight increase in SO2 concentrations were observed for the entire country. The annual average SO2 concentrations in different towns ranged from 17 to 132 micrograms/cu m. The particulate concentrations were between 30 and 50 micrograms/cu m in most places. The SO2 concentrations showed a slight decrease in the Paris region which was due to the exceptionally mild weather. The particulate concentrations showed little difference between summer and winter, indicating good adjustment of heating equipment.

52416 **APTIC NO. 74817**

Furukawa, Akira, Chozo Furuga, and Yoshio Kitagawa

SURVEY ON THE OFFENSIVE ODOR AT THE FISHING PRODUCTS DISPOSAL PLANT, PART 1. *(Gyochokotsu shori kojo no akushu chosa, dai 1-ho). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:88-91, March 1975.*

The odor from a fish products disposal plant in Hagi, Japan was investigated for hydrogen sulfide, methyl mercaptan (MM), dimethyl sulfide (DMS), trimethylamine (TMA), dimethyl disulfide (DMDS), and ammonia. The plant treated 5 ton/day fish to make the fish powder and fish oil. The average level of odor strength within the plant was more than 3.5 units. Odors near a cooker and screwpress were the highest detected. Concentrations of 35 ppb for H2S, 58 ppb for MM, 1.5 ppb for DMS, 2.7 ppb for DMDS, 360 ppb for TMA, and 3.9 ppm for NH3 were measured; and the odor strength was about 4.7 units. With wind blowing toward measuring points 70 m and 100 m from the plant, the former measuring point showed an odor strength of 3.7 units and 60 ppb TMA and 2 to 4 ppb H2S and MM; the later point showed an odor strength of 3 units, with H2S, TMA, and MM, being detected. The odor was noticeable 200 m downwind from the plant.

52417 **APTIC NO. 74686**

Goto, Norihiro and Michihiro Kidawara

THE STUDY OF AIR AND WATER POLLUTION IN NIIHAMA CITY. *(Niihama-shi no kogai ni kansuru kiso kenkyu, dai 1-ho). Text in Japanese. Niihama Kogyo Koto Senmon Gakko Kiyo (Mem. Niihama Tech. Coll.), no. 11:42-52, Jan. 1975.*

Nitrogen oxides and oxidant concentrations were measured at various locations in Niihama city in 1973. Nitrogen oxides were analyzed by the Saltzman method while oxidants were measured by the potassium iodide method. At the Niihama Municipal Office on Aug. 3, the NOx concentration varied from 0.108 ppm at 9:00 am to 0.201 ppm at 11:00 am to 0.050 ppm at 2:00 pm. At the Niihama Police Department on Oct. 15, the NOx concentration varied from 0.175 ppm at 9:00 am to 0.260 ppm at 12:00 pm to 0.453 ppm at 3:00 pm to 0.540 ppm at 5:30 pm. The highest NOx concentration at the City Pool on Oct. 23 was 0.172 ppm at 2:00 pm. At the Niihama Police Department on July 28, the oxidant concentration varied from 0.052 ppm at 10:00 am to 0.103 ppm at 1:50 pm to 0.049 ppm at 5:00 pm. At the Civic Center on July 30, the oxidant concentration varied from 0.058 ppm at 10:00 am to 0.131 ppm at 2:35 pm to 0.032 ppm at 6:00 pm. At the Niihama Higashi High School on July 31, the oxidant concentration varied from 0.039 ppm at 10:20 am to 0.123 ppm at 1:10 pm to 0.049 ppm at 5:10 pm. At the Niihama Elementary School on Aug. 2, the oxidant concentration varied from 0.049 ppm at 10:35 am to 0.126 ppm at 2:00 pm to 0.039 ppm at 5:10 pm.

52418 **APTIC NO. 74929**

Hida, Masahiko, Taeko Honda, Mineo Matsumoto, and Shigenori Utsumi

THE CAUSE OF DAMAGES CAUSED BY SO-CALLED PHOTOCHEMICAL POLLUTION. *(Iwayuru kokagaku higai no hassei genin ni tsuite). Text in Japanese. Preprint, Japan Society of Pharmacy, Tokyo, p. 109, 1975. (Presented at the Japan Society of Pharmacy, Annual Meeting, 95th, Nishinomiya, Japan, April 4-6, 1975.)*

Areas that were allegedly affected by photochemical smog in terms of property damage and human illness were investigated for other causal factors. Hydrogen sulfide levels in the damaged areas were examined along with the lowering of oxygen content in the atmosphere. The results indicated that the causes of the serious damage were possibly due to the emanation of poisonous substances, such as H2S, from the earth and sulfur dioxide formed in the atmosphere, along with the lowering of oxygen content. Damage encountered on May 17, 1974 at a school was serious in an area where ditches were located. The ditches were full of sludge and garbage. Coal cinders were also a possible cause of the formation of sulfur compounds.

52419 **APTIC NO. 74911**

Hioka, Hajime

MOVEMENT TO MEASURE NITROGEN DIOXIDE IN OTA WARD. *(Ota-ku ni okeru nisanka chisso sokutei undo). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo, p. 284-285, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Nitrogen dioxide measurements were taken during a 48-hour period in December 1973 at 900 locations in Ota Ward, Tokyo, Japan, with the cooperation and participation of the ward residents. Two samples were obtained at each location. A seminar on how to make and use simple NO2 measurement apparatus had been conducted in October 1972. This collection device (Tenya method) is a plastic tube with a cover, in which is placed alkali filter paper. The tube is exposed to air, and nitrogen dioxide is captured as nitrite. After addition of Saltzman reagent, nitrite is determined by colorimetry. Of the 1800 samples taken, 1706 were recovered. The average value of NO2 for Ota Ward was 0.075 ppm, compared to the environmental standard (daily average) of 0.02 ppm. Values below the environmental standard were found only 0.5% of the time. The degree of pollution was higher in the industrial area in the southern part of the ward for both days. When high pollutant values were recorded in the residential areas, they were in conjunction with areas where traffic had increased and traffic lights and stop signs had been installed.

52420 **APTIC NO. 74339**

Hirota, Jo and Haruo Katsunuma

INVESTIGATION OF HEAVY METALS CONTAINED IN ATMOSPHERIC PARTICLE SUBSTANCES ON HEAVY TRAFFIC ROADS. *(Hanbo doro jo taiki no ryushi jo bushitsu chu ni fukumareru junkinzokurui ni tsuite no jittai chosa). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), vol. 5:24, April 1975.*

Air at busy intersections of a highway was sampled at 500 l/min with a high volume sampler, and dusts were collected on a fiberglass filter. The metals in the dusts were dissolved in acid by heating; and lead, copper, and cadmium were analyzed by atomic absorption, while iron and vanadium were analyzed by colorimetry. On March 5, 1974, the dust and carbon monoxide concentrations at the Shimura san-chome intersection ranged from 1.05 to 1.23 mg/cu m and 5.0 to 7.8 ppm, respectively, at one location and from 1.09 to 1.50 mg/cu m and 4.0 to 6.6 ppm, respectively, at another location. The average lead, copper, cadmium, zinc, iron, and vanadium concentrations in dust on a paved street were 524 ppm, 614 ppm, 5.1 ppm, 1.69%, 5.31%, and 91 ppm, respectively; those on a side walk were 857 ppm, 1.750 ppm, 13.3 ppm, 3.13%, 5.06%, and 85 ppm, respectively.

52421 **APTIC NO. 74429**

Ishizaki, Ichiro

ANALYSIS ON THE OCCURRENCE OF SULFUR DIOXIDE HIGH LEVEL AT SAIJO REGION. *(Saijo chiku chijo SO2 konodo hassei jokyo no kaiseki). Text in Japanese. Preprint, The Inst. of Electrical Engineers of Japan, Tokyo, 2p. 1974. (Presented at the Japan Institute of Electrical Engineers Shikotu Branch Meeting, Takamatsu, Japan Oct. 15, 1975.)*

Sulfur dioxide pollution in 1973 through 1974 is discussed for the Saijo area of the Ehime Prefecture. The highest areal SO2 level observed was 0.45 ppm which occurred in June 1974, while the highest SO2 level in 1973 was 0.27 ppm. An emergency warning was issued to the area whenever the SO2 level exceeded more than 0.1 ppm. The wind direction related to the number of emergency warnings issued, and the relationship with northeast winds was especially high. The Saijo area is located slightly inland, and a power station is situated to the northwest at the seashore; the Shikoku mountains are in the southern part of the area. Therefore, the box theory applies well to the areal pollution observed. The emission rate of the power station was 700 normal cu m/hr, and the total emission rate of nearby small sources was 100 normal cu m/hr. Although the environmental capacity of SO2 for the Ehime Prefecture was 2000 normal cu m/hr SO2 (according to a simulation) and was capable of maintaining 19 ppb as the year average SO2 level in the prefecture, this environmental capacity was not enough for the Saijo area due to its unique location.

52422 **APTIC NO. 74868**

Ito, Tomoyuki

THE MEASUREMENT OF SUBMICRON AEROSOLS ON THEE PACIFIC (STUDIES ON THE BACKGROUND AEROSOLS. 3). *(Taiheiyo jo no submicron aerosol no sokutei (background aerosol no kenkyu. 3)). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 71, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

Aerosol measurements made over the Pacific in the winter are reported. Sample collection was performed with a plastic pipe with an inner diameter of 50 mm. The pipe was mounted on a ship and kept parallel to the wind. The ship left Tokyo Harbor on November 21 and sailed through the Marcus Islands, Chichi Jima, and then to Tokyo. The aerosol concentration continuously decreased as the ship sailed away from the land, and decrease continued up to a point 1000 km from land. The effect of periodical winds was also noticed. Particle diameters rapidly increased up to a point 300 km from land; then the particle diameter remained unchanged. The particle size was also dependent on the direction of the wind. The number of larger particles was greater in the winter than in summer. The origin of these particles was not gas-particle conversion but rather the transport of particles from the land by wind.

52423 **APTIC NO. 74803**

Kagawa, Fumiko, Kunihiko Inazawa, and Hiroko Saruyama

DETECTION OF CYANOGEN IN ATMOSPHERE AND RAIN. *(Taiki to usui chu no shian no kenshutsu ni tsuite). Text in Japanese. Preprint, Society for General Research, Environmental Science, Tokyo (Japan), p. 63, 1975. (Presented at the Society for General Research, Environmental Science, 1st Meeting, Tokyo, Japan, June 1975.)*

In order to investigate the validity of the theory that cyanogen is the cause of severe photochemical smog afflication, microamounts of (CN)2 in the atmosphere and rain were measured by the pyridine- benzidine method using a calorimeter at three high schools in the Kanto area during the period of June to August 1974. A sample solution prepared by passing air through 10 ml of absorbent solution at the rate of one l/min for 1-4 hr and rainwater were analyzed. The (CN)2 concentration was generally higher on days of high oxidant concentration. Around July 3rd, when the entire Kanto area had acid rainfall, the (CN)2 concentration was relatively higher. The (CN)2 concentration in rain water was of the ppm order, while that of air was less than 10 ppb except for a few days when it reached as high as 25 ppb.

52424 **APTIC NO. 74857**

Kaji, Hironari, Tadashi Ito, Nobuhiko Nakano, and Kazuo Kimura

THE ANALYSIS OF ATMOSPHERIC POLLUTION BY GC AND GC-MS AT THE TAISHIDO MIDDLE SCHOOL, TOKYO. *(Tokyoto, Taishido Chugakko ni okeru GC, GC-MS niyoru taiki osen bunseki). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 67-70, 1975. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

Organic compounds of low and medium boiling point were collected on C-22, in which 100-200 cc atmosphere was collected by cooling with liquid oxygen. Aromatic compounds of high boiling point were collected with a high volume sampler. Gas-chromatographic analysis of the low and medium boiling point compounds collected from the air over Tokyo, showed that ethylene and acetylene were present in relatively large amounts. Butenes were rarely found. The concentration of propylene was only 1-3 ppb. However, propylene was always found. In most cases toluene showed the largest concentration. Benzene was next. Besides these, methyl chloroform, acetone, methyl ethyl ketone, and alcohols were usually found. Acrolein and other aldehydes were rarely detected. The concentration of acetylene in the atmosphere was larger than that in automobile exhaust gas. In order to identify the origin of the organic substances in the air, the correlation between the carbon monoxide concentration in air and other organic materials was studied, the CO concentration being taken as the index of contamination by automobile exhausts. The correlation factor was large with ethylene, propylene, pentane, toluene, and isopentane.

52425 **APTIC NO. 74648**

Kawamura, T.

A FEW PROBLEMS CONCERNING AIR POLLUTION METEOROLOGICAL CHARACTERISTICS. *(Taiki osen kishi ni kansuru ni san no mondai). Text in Japanese. Tohoku Gijutsu-dayori (Tohoku Technol. Bull.), no. 73:1-20, Feb. 1975.*

Recent changes in sulfur dioxide levels suggest a drastic change in emission sources, including higher stacks and an increase in automobiles. No decisive measures have been taken to control nitrogen oxides; and they appear to be increasing, making it unlikely that photochemical smog will decrease. Areas where photochemical smog warnings are issued are increasing. The incidence of acidic rain is also attracting attention; sampling of rain water, however, must be standardized. Meteorological conditions under which photochemical smog is apt to occur are discussed. Air pollution is spreading to wider regions lately. Three-dimensional surveys of photochemical air pollution during 1972 and 1973 with the cooperation of Tokyo, Kanagawa, Chiba, and Saitama Prefectures are described. The data are limited, however, and surveys should be made over wider areas. The importance of the atmospheric boundary layer in air pollution studies is stressed.

52426 **APTIC NO. 74362**

Kellner, Karl-Heinz

CONCENTRATIONS OF NITROGEN OXIDE FROM RANDOM SAMPLES AND CONTINUOUS MEASUREMENTS IN THE CITY OF MUNICH. *(Stickstoffoxidkonzentrationen aus Stickproben und Dauer-*

messungen im Stadtgebiet von Muenchen). Text in German. Staub, Reinhaltung Luft, 35(4):154-156, 1975.

The variability of nitrogen oxide concentrations with differences in traffic patterns and weather conditions, particularly the vertical temperature profile near the ground was investigated. Since 1967 random samples for determinations of the concentration of nitric oxide plus nitrogen dioxide have been taken at 40 measurement stations in Germany arranged on the basis of the Gauss-Krueger grid over intervals of 1 km. Since August 1972 continuous measurements of the sum of NO plus NO2 have been taken at eight permanent measuring stations which are the precursors of a monitoring system for all of Bavaria. The results of the measurements to date have shown that the annual averages for the sum of NO and NO2 from random sample measurements increased between 1967 and 1970 and decreased the next year, remaining steady since 1971. The decrease can be explained by a change in the traffic situation with respect to the location of the measuring stations but not by a decrease in emissions. The average for the sum of NO and NO2 was about 0.12 ppm. Seasonal fluctuations were slight. Based on an oxides of nitrogen concentration of 100% at 1.5 m above ground, the concentration decreased to 74% at 7.5 m above ground and to 20% at 13.5 m above ground.

52427 **APTIC NO. 74854**

Kitagawa, Shinichiro, Kazuki Funaki, and Hiroshi Morimura

ON THE RELATIONSHIP BETWEEN RESULTS OF CONTINUOUS SMALL ION CONCENTRATION MEASUREMENTS AND PHOTOCHEMICAL SMOG WARNINGS AND ALERTS IN URAWA CITY. *(Urawa-shi ni okeru sho ion nodo renzoku sokutei kekka to kokagaku sumoggu chuiho, keiho tono kankei). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo, p. 54-55, 1975. 4 refs. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Continuous measurements of small ion concentrations were taken from July to September 1974 at Saitama University, Japan, and results were correlated to oxidant concentrations for the same period. Typically, small ion concentrations have a maximum during the night and minimum during the day, when the air is clean. This pattern was observed on an average of 49% of the time during the months of July to September. Temporary increases in oxidant concentration did not affect small ion concentration change patterns. However, when oxidant concentrations increased beyond the warning level of 0.15 ppm, decreases in small ion conentrations became evident. Average small ion concentrations (ions/cc) for the 3 mo were as follows: average daily value, 105; average value from 12-6 pm, 96; and average value when oxidant concentrations were greater than 0.15 pmm, 75. Correlations between small ion concentrations and concentrations of nitric oxide and nitrogen dioxide were not discerned, but oxidant concentration increases were accompanied by decreases in NO concentration.

52428 **APTIC NO. 74345**

Kitagawa, Yoshio, Akio Sueda, Hiroshi Ryomi, and Yoshihide Nishida

ON THE AIR POLLUTION AT IWAKUNI CITY, PART 10. *(Iwakuni shigaichi no taiki osen ni tsuite, dai 10-ho). Text in Japanese. Yamaguchi- ken Eisei Kenkyusho Nenpo (Annu. Rept. Yamaguchi Prefect. Inst. Health), no. 16:61-66, March 1975.*

Air pollution survey results in 1973 at Iwakuni, Japan are reported for sulfur dioxide (21 stations) and dusts (13 stations). The average SO2 level was 0.31 mg sulfur trioxide/day/100 cu cm lead oxide, and the maximum level at one station was 0.58 mg SO3/day/100 cu cm PbO2. The average SO2 level in 1973 decreased from that in 1972 by 6% and reflected a reduction in fuel combustion from 1972 to 1973 as well as a reduction in fuel oil sulfur content in 1973. The average sulfur content of heavy oil used in 1972 was 1.45% as compared to 1.26% sulfur in 1973. The average dust amount per station was 4.85 ton/cu km/mo, of which 2.14 ton/cu km/mo was soluble and 2.71 ton/cu km/mo was insoluble. The maximum precipitated dust amount was 12.32 ton/cu km/mo at one station. The average dust amount in 1973 decreased from 4.85 ton/cu km/mo for the previous year and reflected the fact that coal us was stopped in 1973.

52429 **APTIC NO. 74406**

Kitagawa, Yoshio and Akira Furukawa

OFFENSIVE ODOR INVESTIGATION AT THE INDUSTRIAL WASTE MANAGEMENT PLANT. *(Sangyo haikibutsu shori kojo no akushu chosa seiseki ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:93-94, March 1975.*

Offensive odors from an incinerator for industrial wastes were determined. The incinerator combusted waste oil, pesticide residue, acrylonitrile-butadiene-styrene resin, and waste drugs. The odor strength was classified into six categories, and odor components were determined by gas chromatography with a flame ionization detector. Questionnaires were distributed to 47 inhabitants within 1.1 km of the incinerator for a human sensory evaluation. An odor strength of 3 units was sensed at 1 km from the incinerator. Some odor was sensed by 30 out of 47 people, and eight out of nine people who lived within 300 m of the incinerator, detected odors. Symptoms of eye irritation, headache, tearing, and sore throat, were experienced. When the incineration temperature was decreased, the odor intensity increased. The use of an afterburner is suggested as a control measure. Storage of untreated waste must also be changed from its present outside method. When wet waste is combusted, the combustion temperature decreases, leading to incomplete combustion; thus indoor storage is recommended.

52430 **APTIC NO. 74412**

Kitagawa, Y., A. Sueda, M. Ito, and H. Ryomi

ENVIRONMENTAL ATMOSPHERIC INVESTIGATION AT THE INLAND SEA AREA. *(Setonaikai chiiki kankyo taiki chosa seiseki ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:83-86, March 1975.*

Air pollution survey results at Kamizeki, Japan are reported for iron, manganese, zinc, lead, nickel, cobalt, cadmium, vanadium, chloride ion, nitrate ion, and sulfate ion in airborne dusts and for atmospheric cyanide, ammonia, and mercury. The study was part of a joint survey to determine the atmospheric background level in the inland sea area. The sampling location was situated on a hill surrounded by mountains to avoid direct interference by pollution sources. The typical dust concentration at this location was 73 micrograms/cu m air; no vanadium was detected. Average levels of 1.6, 2.9, 10, 0.8, 0.038, 0.11, 0.042, 0.019, 0.0019, and 0.0014 micrograms/cu m air for chloride ion, nitrate ion, sulfate ion, iron, manganese, zinc, lead, nickel, cobalt, and cadmium, respectively, were measured in dust samples. No atmospheric cyanide ion was detected; however, the average ammonia found was 11 micrograms/cu m which was mainly due to a nearby toilet. The nitrate ion level in the dusts was higher than the general background level; othersise, the levels observed were representative of inland sea background levels.

52431 **APTIC NO. 74413**

Kitagawa, Y., M. Ito, and K. Kaneda

ON THE AIR POLLUTION AT BOHU CITY. *(Bofu shi no taiki osen ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:68-72, March 1975.*

Air pollution survey results from April 1973 to April 1974 at Bohu, Japan are reported for sulfur dioxide and dusts which were measured at 15 locations in the city. The average SO2 level was 0.28 mg sulfur trioxide/day/100 cu cm lead oxide as compared to the previous year level of 0.32 mg SO3/day/100 cu cm PbO2. The maximum SO2 level which was observed in May at one sampling station was 1.06 mg SO3/day/100 cu cm PbO2. The average dust amount was 6.12 tons/sq km/mo which increased from 5.13 tons/sq km/mo for the previous year. The SO2 level tended to be higher during the period of April through August than during the period of September through March. The higher SO2 level coincided with more frequent observations of southeast winds during April through August. The southeast winds were responsible for the transport of SO2 from industrial areas to the city. No seasonal trend in dust amount was observed.

52432 **APTIC NO. 74519**

Kitagawa, Yoshio, Akira Furukawa, Chozo Furutani, Akio Sueda, Masatoshi Ito, Kan Ryomi, Toshibumi Hayata, and Yasunobu Sadakane

STUDIES ON THE SUSPENDED PARTICLES IN VARIOUS CITIES, YAMAGUCHI PREFECTURE; PART 3. *(Yamaguchi-ken shotoshi no fuyu funjin ni kansuru kenkyu dai 3-HO). Text in Japanese. (Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:77, March 1975.*

The airborne dust at five cities in Yamaguchi Prefecture was collected by a high volume air sampler with a membrane filter and analyzed for content of calcium, magnesium, iron, manganese, lead, copper, nickel, cadmium, chromium, cobalt, sulfate ion, nitrate ion, chloride ion, and organic matter. The analytical methods used were atomic absorption spectrometry for metals, turbidimetry with barium sulfate for sulfate ion, and colorimetry with 2,4-xylenol for nitrate ion. Onoda city, which has a cement manufacture and magnesium manufacture, showed the highest dust among the five cities and the average value found in Onoda was 130 micrograms/cu m. The calcium and magnesium contents in the dust were also highest in Onoda city and their average values were 4.7 and 1.4 micrograms/cu m respectively, which reflected the effect of the manufactures in the city. Iwakuni city showed high organic matter, iron, and lead content in dust and their average concentrations were 80, 25, and 1.1 micrograms/cu m respectively, which reflects the fact that it is a petrochemical industrial city.

52433 **APTIC NO. 74816**

Kitagawa, Yoshio, Akira Furukawa, Akio Sueta, and Masatoshi Ito

SURVEY ON THE OFFENSIVE ODOR AT THE FISHING PRODUCTS DISPOSAL PLANT, PART 2. *(Gyochokotsu shori kojo no akushu chosa, dai 2-ho). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:91-93, March 1975.*

Survey results on offensive odors from fish disposal plants in the Senzaki area of Yamaguchi Prefecture are reported. The area has two fish disposal plants each of which processes 4 to 6 tons/day fish to make fish powder and fish oil. Both plants have similar capacity and processes of boiling, pressing, separating, and drying. Hydrogen sulfide, methyl mercaptan (MM), dimethyl sulfide (DMS), trimethylamine (TMA), and ammonia in the ambient atmosphere were determined; human sensory tests were also made. The exhaust gas from a rotary dryer showed very high levels of odorous components, and the TMA and ammonia concentrations were 23 ppm and 47 ppm, respectively. The average levels for the odorous components within the plant grounds were 130 ppb for TMA, 2.2 ppb for H2S, 1.0 ppb for MM, 1.3 ppm for NH3, and less than 0.5 ppb for DMS. With wind blowing toward measuring points 50 m from the plants, the average TMA level measured was 48 ppb and its odor strength for six categories was more than 3 units. The odor strength of TMA at 100 m from the plants was 2.5 units with the wind blowing. A level of 16 ppb for TMA was detected sometimes at 300 m from the plants. Human sensory tests indicated that all people living within a 100-meter radius of the plants sensed odors; no person who lived outside of a 500-meter radius perceived odors. The odor strength and concentration of odorous components decreased with distance from the plants under the same meteorological and plant operating conditions.

52434 **APTIC NO. 74405**

Lahmann, E.

THE INFLUENCE OF EFFLUENT EMISSIONS ON URBAN ATMOSPHERE. *(Der Einfluss der Schadgas-Emissionen auf die Stadt-atmosphaere). Text in German. Gesundh.-Ingr., 96(5):121-126, Jan. 1975. 25 refs.*

The main sources of urban air pollution are households, traffic, industry, and trade. Power plants and incinerators are particularly significant sources of air pollutants. With regard to quantity, the most important urban air pollutants are dusts and the gaseous oxides of sulfur, carbon, and nitrogen, as well as hydrocarbons. Detailed information on the spatial and temporal distribution of pollution levels in urban areas is available for sulfur dioxide, carbon monoxide, nitric oxide, and dust, as well as for lead which is an important component of urban dust. Results of recent measurements of SO2 and CO in West German cities are tabulated. A comparison with the maximum allowable air concentrations reveals that the SO2 level in large cities reaches or exceeds the limits. Compared to other major pollutants, CO is less homogeneously distributed in urban air. Carbon monoxide levels are highest in the immediate vicinity of major traffic arteries and are closely correlated with the traffic density. The SO2 concentration in an urban area usually grows with the size of the urban conglomeration and increases from the suburbs toward the center. In the center of Berlin, the SO2 concentrations measured in the winter of 1972 were 0.35 to 0.36 mg/cu m as compared to suburban values of 0.12 to 0.15 mg/cu m. In general SO2 levels in urban areas have dropped in the last few years mainly due to a switch from individual home heaters to central heating and oil heating. The CO levels have increased over the last few years. No clear trend for dust levels is established from available measurements. The influence of urban construction and planning on urban air pollution levels is briefly outlined.

52435 **APTIC NO. 74987**

Masek, V.

THE CONNECTION BETWEEN THE TOTAL AMOUNT OF FLY ASH AND THE FINE DUST CONTENT IN THE AIR OF WORKING AREAS. *(Zum Zusammenhang zwischen dem Gesamtflugstaub- und Feinstaubgehalt in der Luft der Arbeitsstaette). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 25(6):167-173, 1975. 7 refs.*

The results obtained from 295 twin samples taken simultaneously by two-stage dust analyzers at 23 selected working areas in a hard-coal coking plant were used for concentration calculations. On the average, the fine dust concentration depended on the total fly ash concentration. Furthermore it was found that the extent of correlation between the results of the two analyzers rapidly decreased with increasing total fly ash concentration.

52436 **APTIC NO. 76742**

Masuhara, Takaal

ATMOSPHERIC POLLUTION BY CO IN THE CITY OF TOKYO. II. *(Tokyo to ni okeru CO ni yoru taiki osen ni tsuite. II). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 58, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

Atmospheric carbon monoxide over Tokyo was measured along with wind direction and velocity between April and August of 1974. The collections were made two to three times a day, and the samplers were situated 1m above the ground. The wind readings were made every 10 sec. The sites of measurement were Iwaida- bashi, Komazawa Park, Chitose-Funabashi, and a street in front of Tokyo Agricultural University. The concentration of CO was dependent upon the amount of traffic and the structure of the roads. The effect of the amount of traffic was more significant at a point 5 m away from the road than at a point between the sidewalk and the road. This was attributed to the relationship between the effective height of the vehicle exhaust and the sampling height.

52437 **APTIC NO. 74727**

Miyazaki, Ichiro

AIR POLLUTION AROUND THE KEIHIN HEAVY CHEMICAL INDUSTRIAL ZONE, AND LIVING ENVIRONMENT AND HEALTH INJURY IN THE INHABITANTS THEREIN. *(Keihin jukagakukogyo chitai shuhen chiku ni okeru taikiosen to jumin no seikatsu kankyo oyobi kenko higai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(8): 888-900, Aug. 1975.*

A survey of air pollution levels and the health of high school pupils and their parents was conducted in a heavily industrialized area of Kawasaki, Japan. The concentration of sulfur oxides in 1974 was about a half of that in 1970 (0.029 ppm). The concentration of nitrogen oxides ranged from 0.030-0.040 ppm. There was a correlation between the concentrations of oxides of sulfur nitrogen. According to questionnaires, about 32% of the inhabitants showed concern about air pollution and photochemical smog. About 22% of the inhabitants complained of symptoms such as cold, rhinitis, and pharyngitis; and there was a correlation between total subjective symptoms and concentration of sulfur oxides. Near roadsides the concentration of nitrogen oxides was very high. Green plants are gradually disappearing from the heavily polluted area. Further industrialization in this area appears to be very dangerous for man and other living things.

52438 **APTIC NO. 74752**

Morita, Yasuhiro, Masumi Takagi, and Seiji Ishikawa

THE BEHAVIOR OF FINE PARTICLE POLLUTANT IN ATMOSPHERE. *(Taiki-chu no biryushi osen busshitsu no doko). Text in Japanese. Preprint, Japan Society for General Research, Tokyo, Environmental Science Div., p. 33-34, 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Measurements aboard a ship of minute airborne particles less than 0.1 micron in diameter were made at points farther than 1000 km from continents. Particle counts were: on a route from Tokyo to the equator, 410 + or - 29/cc; Mexico to Tokyo, 484 + or - 28; Hawaii to the equator, 334 + or - 24; Chile to the equator, 293 + or - 9; and the equator to Chile, 334 + or - 10. The concentrations of larger particles with a diameter between 0.2 and 1.0 micron were 4.3/cc, 2.8, unknown, 1.1, and 7.2, respectively. The data revealed that pollution by fine particles is much less in the southern hemisphere than in the northern hemisphere, whereas that by larger particles is almost the same in each hemisphere. An independent measurement of the concentration distribution of larger particles with a diameter between 0.15 and 1.0 micron indicated that the number of larger particles increases as the measurement site is moved away from Tokyo and toward the center of the ocean, indicating that the origin of the larger particles is the ocean itself. For the concentration of fine particles that originate from continents, a time constant concept of lowering of concentration holds. This constant varies with the diameter of the particles.

52439 **APTIC NO. 74561**

Nagai, K., K. Naka, B. Matsubayashi, M. Takatsuka, and M. Murata

METHODS OF MEASUREMENTS AND EXAMPLES OF MEASUREMENT ON ODOROUS SUBSTANCES (LOWER ALDEHYDES AND STYRENE) IN THE PETROCHEMICAL COMPLEX AREA. *(Sekiyu Kombinato chiiki ni okeru akushu busshitsu (teikyu aldehydes, styrene) no sokutei-ho to sokutei-rei ni tsuite). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(19):23-32, March 1975. 32 refs.*

The determination of airborne odorous compounds (lower aldehydes and styrene) near a petrochemical complex in Yokkaichi is described. Gas chromatography was adopted for the determination of lower aldehydes. The highest concentrations of formaldehyde, acetaldehyde, propionaldehyde, and butylaldehyde measured on August 5, 1974 were 36, 46, 7.5, and 6.1 ppb, respectively. Styrene was also determined by gas chromatography. The concentration of styrene was less than 5 ppb at the end of November 1974. Styrene at this concentration was hardly noticed by the residents. Acrolein was not detected by gas chromatographic, colorimetric, or hexyl resorcin methods. The collection of the sample gases was made with a vacuum bottle and low temperature condensation apparatus.

52440 **APTIC NO. 74418**

Oikawa, Kikuo

APPLICATION OF X-RAY DIFFRACTION TO ENVIRONMENTAL POLLUTION ANALYSIS. *(Kankyo osen bunseki ni okeru x-sen kaiseki no oyo). Text in Japanese. Bunseki Kiki (Analysis Instr.), 13(3):135-139, March 1975. 7 refs.*

An X-ray diffraction technique for the analysis of metal compounds in airborne particulates was investigated. Airborne particulates in the industrial area of Kawasaki were collected by a high volume sampler on a nitrocellulose membrane filter, and the filter was then analyzed by X-ray diffraction. An alpha-silicon dioxide and calcium sulfate were identified at all stations, and their origin appeared to be the soil. A higher concentration of calcium sulfate was found in an area showing a higher sulfur dioxide level, indicating a reaction between calcium compounds and SO2. The alpha-ferric oxide and triiron tetroxide were identified in samples obtained near iron manufacturing plants. Sodium chloride was found in a larger concentration in the summer than in the winter, indicating the effect of sea wind in the summer. Quantitative analysis by the X-ray diffraction of alpha-ferric oxide and triiron tetraoxide was studied. After the filtered substances were dissolved in acetone (titanium oxide was the internal standard), the acetone was evaporated; its residue was used as the sample for X-ray diffraction. The quantitative analysis was performed within 2 to 3 hr per sample.

52441 **APTIC NO. 74828**

Oyake, Tatsunori and Shuji Tabuchi

SURVEY ON THE ENVIRONMENTAL POLLUTION BY AUTOMOTIVE EXHAUST GAS IN OTARU CITY. *(Showa 47 nendo otaru-shi hanazono kosaten ni okeru jidosha haishutsu gasu ni yoru kankyo osen chosa sokutei kekka ni tsuite). Text in Japanese. Hokkaido Kogai Boshi Kenkyusho Ho (Rep. Hokkaido Res. Inst. Environ. Pollut.), no. 1:43-55, March 1975.*

Carbon monoxide, nitrogen oxide and hydrocarbon concentrations at the Hanasono intersection in Otaru, Japan were measured from July 1 to December 31, July 6 to November 25, and July 9 to October 31, 1972. Carbon monoxide was analyzed by non- dispersive infrared NOx by the Saltzman method, and hydrocarbons by a hydrogen flame ionization detector. The monthly average wind velocity was generally below 0.5 m/sec at the intersection. The highest 8-hour average concentration of CO was 17.0 ppm; the 8-hour average concentration exceeded 10 ppm on 27 days in July, 17 days in August, 14 days in September, 9 days in October, and 16 days in November as well as in December. The total number of days with NOx concentrations exceeding the environmental standard (1 hour value for 24 hr) of 0.02 ppm was 89 out of 123 effective measurement days. Total hydrocarbons showed a maximum concentration in the evenings. The average traffic number was 2000-2500 vehicles/hr.

52442 **APTIC NO. 74832**

Shirakawa, Hiroshi, Ryosaku Endo, Motoi Kamada, Hajime Idaka, Tatsunori Oyake, and Toshiaki Nakajima

THE INVESTIGATION OF SO2 CONCENTRATION IN KUSHIRO CITY. *(Kushiro-shi ni okeru nisanka iou no nodo bunpu ni tsuite). Text in Japanese. Hokkaido Kogai Boshi Kenkyusho Ho (Rep. Hokkaido Res. Inst. Environ. Pollut.), no. 1:23-42, March 1975. 2 refs.*

Investigations of sulfur dioxide concentration in Kushiro, Japan were carried out in December 1970 and March 1971 at 20 locations widely dispersed throughout the city. The distance between two adjacent locations averaged about 1 km. Weather conditions including wind direction and wind velocity were measured at six monitoring stations. Air was sampled with a hand sampler, and sulfur dioxide was analyzed by the pararosaniline method. For a long term investigation from 1969 to 1971, the SO2 concentration was measured by the lead oxide method. Air pollution in Kushiro was a mixture of urban and industrial types. High concentrations were observed in the mornings and the evenings. The concentration in the city was generally high when west-southwest to west to west-northwest winds prevailed, particularly south of a railroad where the highest concentration was 0.123 ppm. With northwest to north-northwest to north to north-northeast to northeast winds prevailing, the high concentrations were found at the west side of Kushiro river and south of the railroad.

52443 **APTIC NO. 74931**

Sugiura, Kimiaki

ENVIRONMENTAL POLLUTION CAUSED BY AUTOMOBILE (PART 3): INVESTIGATION OF STATUS OF NITROGEN DIOXIDE POLLUTION AND ITS COUNTERMEASURES. *(Jidosha ni yoru kankyo osen (sono 3): nisanka chisso osen no jittai haaku to sono taisaku). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo, p. 52-53, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Nitrogen dioxide concentrations were determined for several cities in Saitama Prefecture, Japan, from April to November 1974. Samples were collected in tubes containing alkali filter paper, which were exposed to the air for 24-hour periods. A simple colorimeter was used for quantitative analysis. The number of monitoring locations in each city ranged from 10 to 200. Nitrogen dioxide concentrations ranged from 0.00 to 0.26 ppm. Monitoring locations at traffic interchanges and along major traffic arteries registered high NO2 concentrations (over 0.10 ppm). At a major intersection in Higashi Matsuyama City, the 8-hour average daytime concentration of NO2 was nearly twice the average 24-hour value, taken on the same day, because of no night traffic. In other measurements, some correlation was found between noise levels and NO2 concentrations.

52444 **APTIC NO. 74812**

Suzuki, Tadashi, Akira Asakawa, and Saburo Ueno

AIR POLLUTION INVESTIGATION BY HIGH SCHOOL STUDENTS. *(Koto gakko kurabu seito ni yoru taiki osen chosa). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo, p. 294-295, 1975. (Presented at the Executive Committee for Symposium of Environmental Science, 1st, Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Measurements were taken of nitrogen dioxide, nitric oxide, and oxidant concentrations at five locations on the grounds of a high school in Tokyo, Japan, which is located next to a high-speed highway. The data cover one week in August 1973. Concentrations of NO and NO2 were determined by colorimetry, after collection of air samples in test tubes, using a pump originally designed for tropical fish tanks. Oxidant concentrations were determined by colorimetry, based on oxidation of phenolphthalein in alkali solution. Daytime changes in NO2 concentrations can be respresented by a W-shaped curve, NO, by a V-shape, and oxidant, by an inverted V-shape. The mimimum for NO, and the peaks for NO2 and oxidant occurred around noon. Although city traffic may decrease, travel outside of the city increases, so that NO measurements at locations along the high-speed highway may increase quite a bit on holidays.

52445 **APTIC NO. 74873**

Watanabe, Kosei, Takamasa Suzuki, Michikuni Shimo, Yoshihiro Asano, and Katsuhiko Hayashi

SMALL IONS IN THE ATMOSPHERE AND THE PARTICLE SIZE DISTRIBUTION OF AEROSOL. *(Taiki sho ion to aerosol ryukei bunpu). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 75, 1975. (Presented at the Japan Meteorological Society, Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

The coefficient of adhesion (beta) of small ions onto aerosol particles was experimentally determined. The relationship between the number of small ions and the particle size distribution of aerosol particles was determined by a static diffusion method. Observation were made in October 1974 in Kiso-Fukushima City, Nagano Prefecture. It was assumed that the rate of formation of ion pairs was independent of time. The values of beta were scattered between 5.3 and 29 times 10 to the -6 cu m/sec, indicating that the particle diameter varied with time. A definite correlation existed between experimentally determined beta values and those calculated from the Keefe-Nolan equation. However, the numerical value of the former was almost eight times that of the latter. Aersol particles larger than 0.2 micron in diameter occupied only 2.8% of all the particles. However, in the theoretical treatment, it was assumed that the particles occupied 14% of all the particles.

52446 **APTIC NO. 74949**

Yamasaki, T.

PRESENT SITUATION OF AIR POLLUTION IN TOMAKOMAI CITY. *(Tomakomai-shi no taiki osen no genjo). Text in Japanese. Hokubu Kanku Kisho Kenkyukaishi (North. Reg. Meteorol. Assoc. J.), 1975:103-104, Jan. 1975.*

Industrial pollution in Tomakomai, Japan is increasing, necessitating the prefectural government to establish a telemetry monitoring center and five monitoring stations since March, 1973. Sulfur oxides appear to have reached a plateau or to have decreased, indicating the effectiveness of pollution control measures. On high air pollution days, SOx reach a peak just before noon. At 9-10 am land and sea breezes change directions. The relationship between the SOx concentration (over 0.05 ppm/hr) with wind direction and velocity was checked. When the wind speed exceeds 3 m/sec, the direction seems to become limited. The relation between weather and SOx concentration was also checked. When high pressure conditions existed, pollution was high.

52447 **APTIC NO. 74866**

Yano, Choku, Kieko Maebashi, Hidetsugu Katsuragawa, and Takayuki Takeuchi

ANALYSIS OF AEROSOL PARTICLES FROM THE ESTIMATION OF BACKGROUND POLLUTION. *(Backgrournd osen hyoka no tameno aerosol ryushi bunseki). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 69, 1975. (Presented at the Japan Meteorologica Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

Studies on the separation of atmospheric pollutant particles from natural particles were performed. Several elements that appeared to originate in the earth s crust maintained their isotopic abundance ratio even when they were mixed with pollution particles to a large extent. The analyses were made either by the neutron activation analysis or by the fluorescent

X-ray analysis. Elements examined were: sodium, magnesium, aluminum, silicon, sulfur, chlorine, potassium, calcium, scandium, titanium, manganese, vanadium, iron, cobalt, nickel, copper, zinc, arsenic, selenium, bromine, rubidium, silver, cadmium, indium, antimony, cesium, barium, lanthanum, chromium, cerium, samarium, lutetium, lifnium, tantalum, tungsten, mercury, lead, and thorium. The ratio between the number of all the aerosol particles to the number of earth crustal particles ranged between 0.1 and 10,000. Data on background pollutants collected at Chichijima, Tokyo Prefecture are reported.

52448 **APTIC NO. 74550**

Environmental Agency (Japan), Office of Air Pollution Control

STATUS OF AIR POLLUTION CAUSED BY PHOTOCHEMICAL REACTIONS IN 1974. *(Showa 49 nen kokagaku hanno ni yoru taiki osen jokyo ni tsuite). Text in Japanese. Ao to Midori (Blue Green), 4(3):92-94, March 1975.*

Days with high oxidant warnings in Japanese prefectures and Tokyo during 1974 are summarized. No area reported any warning day with an oxidant level more than 0.5 ppm (serious emergency oxidant warning). Yamaguchi and Tokushima reported an oxidant level of more than 0.15 ppm (oxidant warning) in 1974, and a total of warnings were in this category. There were six warnings with an oxidant level of more than 0.3 ppm (emergency oxidant warning). The first oxidant warning was announced in Tokyo on April 11, and the last were in Osaka, Chiba, Kanagawa, and Hyogo on October 26. The total number of the oxidant warnings in 1974 was 288, a decrease from the 328 in 1973. The number of oxidant warnings for each month by area were also tabulated; 90 warnings occurred in August, 81 in June, and 28 in July. The meteorological conditions in July were less favorable for the occurrence of photochemical reactions. High school students accounted for 55% of those people suffering from photochemical pollution; this trend was the same as for 1973.

52449 **APTIC NO. 74688**

Sendai Municipal Office (Japan), Bureau of Public Health

PRESENT SITUATION OF AIR POLLUTION. *(Taiki osen bushitsu no genjo). Text in Japanese. In: White Paper on the Environmental Pollution in 1974, p. 10-38, 1975.*

Air pollution measurements were conducted in 1973 at Sendai. Dust concentrations measured at 4 locations from April 1972 to March 1973 ranged from 2.85 tons/sq km/mo at the City Health Station to 8.67 tons/sq km/mo at Norin Chuo Bank. Airborne particulates concentrations measured by light scattering methods at 9 locations ranged from 0.03 mg/cu m at the Takasa Fire Department to 0.16 mg/cu m at the Schichigo Elementary School, with an average of 0.06 mg/cu m. Sulfur oxides concentrations measured by the lead dioxide method at 25 locations ranged from 0.05 sulfur trioxide mg/100 sq cm/day at the Iwakiri Fire Department to 0.32 SO3 mg/100 sq/cm/day at the Norin Chuo Bank. The average concentration was 0.15 SO3 mg/100 sq cm/day, the same as that of 1972 for 22 locations. Hydrogen sulfide concentrations measured at 5 locations ranged from 0.16 micrograms/100 sq cm/day at the City Health Station to 0.35 micrograms/100 sq cm/day at the Nakano Elementary School. Nitrogen oxides concentrations measured at 3 locations ranged from 0.031 ppm at the Nakayama Junior High School to 0.043 ppm at City Health Station. Oxidants concentrations measured at 5 locations ranged from 0.08 ppm to 0.14 ppm while carbon monoxide concentration at 6 locations ranged from 3.2 ppm to 6.4 ppm.

52450 **APTIC NO. 74709**

School Pharmacist Soc., Handa City (Japan)

AIR POLLUTION MEASUREMENT REPORT AT THE SCHOOLS IN HANDA CITY. *(Handa shinai gakko ni okeru taiki osen sokutei kekka). Text in Japanese. Aichiken Yakuzaishikai no Yakuen (Yakuen Aichi Prefect. Pharm. Soc.), no. 220-222, Jan. 1975.*

The atmospheric nitrogen dioxide and sulfur oxide levels around 21 schools in Handa city were measured by an alkaline filter method. The measurement was made three times; Jan. 1973, Aug. 1973, and Jan. 1974. The NO2 level in summer was lower than in winter, and the level in winter decreased from 1973 to 1974. The average NO2 levels found were 0.06, 0.02, and 0.04 mg/day/100 cu cm for Jan. 1973, Aug. 1973, and Jan. 1974, respectively. The SOx level in winter was higher than in summer, however, the SOx pollution at these schools could be classified into two general categories; those schools with SOx pollution less than 1.0 mg/day/100 sq cm or 0.5 mg/day/100 sq cm. No extremely hazardous pollution for SOx and NO2 was found at any school in Handa city.

52451 **APTIC NO. 74733**

Sendai Municipal Office (Japan), Bureau of Public Health

COMPARATIVE STUDIES ON THE ENVIRONMENTAL CONDITION AT SENDAI CITY AND SADAYOSHI AREA. *(Sendai-shi shigaichi to sadayoshi chiku no kankyo joken hikaku). Text in Japanese. In: White Paper on the Environmental Pollution in 1974, p. 45-51, 1975.*

Air pollution in the Sadayoshi area, a farming village about 30 km northwest of Sendai city, was investigated and compared with pollution in Sendai city. Sulfur oxides concentrations at Sadayoshi measured by the lead dioxide method from August 1973 to March 1974 ranged from 0.00 mg sulfur trioxide/100 sq cm/day in December to 0.14 mg SO3/100 sq cm/day in November, with an average value of 0.051 mg SO3/100 sq cm/day. The average concentrations at the Norin Central Bank and the Health Department in Sendai city were 0.355 mg SO3/100 sq cm/day and 0.293 mg SO3/100 sq cm/day, respectively. The SOx concentrations measured by conductivity methods at Sadayoshi during summer (July and August) and winter (November and December) were 0.008 ppm and 0.006 ppm, respectively. The total SOx emission at Sendai city in 1973 was 2841 N cu m, and 88% of the total emission was from industries. Polychlorinated biphenyl concentrations in regenerated fuels from three suppliers were also investigated. The PCB concentration ranged from non-detectable to 7800 ppm.

52452 **APTIC NO. 74838**

AIR POLLUTION. *(Taiki Osen). Text in Japanese. Shigaku Kyoiku Kenkyusho Kiyo (J. Jap. Private Sch. Educ. Inst.), no. 23:30-39, 1975.*

Air pollution levels in Japan are reported along with some resultant health effects. Photochemical smog first occurred in Tokyo during 1967. On July 18, 1970, more than 40 students at the Rissei Girl s High School were treated for eye irritation and throat pain caused by photochemical smog; during July 18 to August 5 of the same year, more than 10,000 injuries were reported. The proportion of the population in Yokkaichi with chronic bronchitis was extraordinarily high among those residents 40 yr or older. The 1-hour sulfur dioxide concentration was as high as 2.5 ppm in the early 1960 s in the city. The carbon monoxide concentrations at busy intersections in Tokyo were 10-15 ppm. The average CO concentration at the Tokyo Municipal Office in 1969 was 10.6 ppm, and more than 50% of the measurements were higher than the environmental standard (1-hour average) of 10 ppm for 24 consecutive hr. Lead poisoning occurred at the Ushigome ward in Tokyo during the late 1960 s and prompted the issuing of new regulations for lead-containing gasoline.

52453 **APTIC NO. 74840**

AIR POLLUTION AND SANITATION. *(Kogai eisei). Text in Japanese. Tokei Kawasaki (Environ. Stat. Kawasaki), no. 81:38-39, 1975.*

Statistics concerning living conditions in Kawasaki during 1971 through 1974 are presented and include the number of pollution complaints filed by people, atmospheric oxidant and sulfur dioxide levels, and the number of patients affected by air pollution. The average annual SO2 level in 1973 ranged from 0.019 to 0.049 ppm; the oxidant level for the same year ranged from 0.026 to 0.038 ppm, depending upon the city district examined.

1974

52454 **APTIC NO. 76677**

Babusik, I.

NITROGEN OXIDES AND OTHER AIR CONTAMINANTS FROM MOTOR VEHICLE OPERATION IN BRATISLAVA. *(Kyslicniky dusika a ine skodliviny z prevadzky motorovych vozidiel v ovzdusi Bratislavy). Text in Slovak. Ropa Uhlie, 16(2):88-93, Feb. 1974. 9 refs.*

Preliminary measurements of automobile air pollution in Bratislava conducted during 1971 indicated 100 mg/cu m levels at some intersections in the city which were five to 10 times higher than the American level of 30 ppm of CO for 8 hr. In April 1973 a total of 16 samples of nitric oxide and nitrogen dioxide were obtained at the Racianska toll plaza (high traffic density) and at Koliba (low traffic density), both in Bratislava. Samples taken at Koliba showed a concentration of nitrogen oxides of about 20 micrograms/cu m, while 11 of the samples taken at the Racianska plaza exceeded the Czechoslovakian standard of 100 micrograms/cu m. Measurements of the lead concentration at various intersections in Bratislava yielded concentrations of about 6 micrograms/cu m which were higher than levels measured in a number of other European cities.

52455 **APTIC NO. 74295**

Hira, Tetsunobu, Shinji Hagiwara, and Takatoshi Tajima

PROBLEMS IN EVALUATING THE AIR POLLUTION WITH THE SEDIMENTED DUST. *(Koka baijin ni yoru taiki osen no hyoka ni okeru mondaiten). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):539, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 387.)*

Sedimented dust was collected by a deposit gauge and analyzed for the amounts of water soluble and insoluble components at 30 stations in Ishikawa Prefecture. The average yearly amounts of two components were similar for all stations; however, higher values for water soluble components were the general trend observed in stations close to the seashore. The monthly transition of amounts of sedimented dust, water soluble components and chloride ion was much the same at all stations, and all levels were highest in October; 17, 15, and 8 ton/sq km/mo respectively. The ratio between sodium and chloride concentrations in the sedimented dust was very close to that of sodium chloride, indicating that the areal sedimented dust was strongly affected by particulates in the ocean atmosphere Therefore, the amounts of sedimented dust cannot be used to evaluate the air pollution level in Ishikawa Prefecture, since the Prefecture faces the ocean and a large portion of the sedimented dust originates from particulates of the ocean atmosphere.

52456 **APTIC NO. 74384**

Nakazawa, Y., H. Kurita, I. Hirosawa, T. Sato, R. Satsuma, and H. Uchida

REPORT OF INVESTIGATION AND RESEARCH: SURVEY OF SEDIMENTARY DUST IN NAGANO PREFECTURE. *(Chosa kenkyu hokoku: Nagano-ken no koka baijin chosa). Text in Japanese. Nagano Prefecture Inst. of Public Health (Japan), Rept. 116, 42p., April 1974. 6 refs.*

Data on sedimentary dust measured at 17 points in Nagano Prefecture during 1973 are compiled. Samples were collected by deposit gauge for one month. The total amount of sedimentary dust, insoluble matters, ash content, in insoluble matters, soluble matters, ash content, sulfate ion, and calcium ion in soluble matters were determined. The average amount of sedimentary dust (g/cu m/30 days) decreased from 4.11 (12 measurement points) in 1972 to 3.23 (19 measurement points) in 1973. Only the sulfate ion (g/cu m/39 days) increased (from 0.33 in 1972 to 0.38 in 1973). The data on the variation in yearly average values from 1967 to 1973 at each point are compiled and analyzed. As for the variation in monthly average value, the total amount and insoluble matter were higher in Jan.-May and lower in July-Nov., while the soluble matter and sulfate ion increased along with increases in precipitation. Maps of measurement points and tables of yearly average amount at each point, monthly average amount at each point, and average of all points and meteorological data including precipitation, number of rain days, number of snow days, and average wind velocity are given.

52457 **APTIC NO. 74386**

Nakazawa, Y., H. Kurita, I. Hirosawa, T. Sato, and H. Uchida

REPORT OF INVESTIGATION AND RESEARCH: SURVEY OF SEDIMENTARY DUST IN NAGANO PREFECTURE. *(Chosa kenkyu hokoku: Nagano-ken no koka baijin chosa). Text in Japanese. Nangano Prefecture Inst. of Public Health (Japan), Rept. 115, 45p., April 1974.*

The data on sedimentary dust measured at 12 locations in 11 cities in Nagano Prefecture during 1971 and 1972 are compiled. For sampling, a deposit gauge with a 20-liter capacity polyethylene jar was placed at 6-17 m above ground level for 1 mo. The total amount of sedimentary dust, insoluble matter, soluble matter, and sulfate ion were determined. The average amount of sedimentary dust (g/cu m/30 days) increased from 4.65 in 1970 and 4.85 in 1971 to 4.87 in 1972. The total amounts of sedimentary dust are particularly high in Shiojiri and Okaya cities (6-7 g/cu m/20 days). The monthly variation showed no particular pattern; however, the soluble matter and sulfate ion showed an increasing trend with increases in precipitation. Maps of measurement points, tables of the yearly average amount of sedimentary dust at each point for 1971 and 1972, monthly average amount of sedimentary dust at each point, and average of all points for 1971 and 1972 are given.

52458 **APTIC NO. 74314**

Ono, Chizuko, Chyou Matsuoka, Tsohio Kitamura, Akiyoshi Nanbu, Toshihiko Ogura, Yoshinori Watari, Heiichiro Kondo, Mitugu Kondo, Kimio Takeda, Koji Yoshimi, and Shigehumi Kondo

SURVEY OF THE ODOR POLLUTION IN TOKUSHIMA PREF. PART II. *(Tokushima-ken ni okeru akushu no chosa. dai-2-ho). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Annu. Rept. Tokushima Prefect. Public Health Lab.), no. 13:27-30, 1974.*

An odor pollution survey was conducted in Tokushima. Measurements of hydrogen sulfide, methyl mercaptan, methyl sulfide, trimethylamine, ammonia, and odor intensity were made during the period August 1972 to December 1973. The data were analyzed in relation to meteorological conditions. At a rayon mill, the H2S concentration was 0.068-0.201 ppm, and the odor intensity was 2-4 units. At a kraft pulp mill, the concentration and odor intensity were 0.002-0.003 ppm and 2-3 units for H2S, 0.002-0.046 ppm and 3-5 units for methyl mercaptan, and 0.007-0.090 ppm and 4-5 units for methyl sulfide, respectively. At a refuse incinerator, the concentration was 1.3-1.7 ppm for NH3 and 0-0.003 ppm for trimethylamine; the odor intensity was 2-4 units. At animal farms, the concentration was 1.1-6.5 ppm for NH3 and 0-0.003 ppm for trimethylamine; the odor intensity was 3-4 units. Control standards (ppm) of 0.05 for H2S, 0.003 for methyl mercaptan, 0.03 for methyl sulfide, 0.005 for trimethylamine, and 1.5 for NH3 are suggested based on the survey results

52459 **APTIC NO. 74712**

Ota, Y. and A. Mizoguchi

PRESENCE OF HALOGENATED HYDROCARBONS IN THE ATMOSPHERE OF TOKYO. (Tonai kukichu no harogen tanka suiso no sonzai ni tsuite). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 85:3, Nov. 1974.

Atmospheric chloroform, 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, and tetrachloroethylene levels at 20 monitoring stations in Tokyo were measured by gas chromatography equipped with an electron capture detector and a 30% n-hexadecane on carbowax column. The analysis was carried out at a column temperature of 40 C, and the detection limit by this system was 0.7, 0.3, 0.05, 1.1, and 0.3 ppb for chloroform, 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, and tetrachloroethylene respectively. The maximum levels found for these compounds were 39.3, 1.7, 4.1, 5.14, and 15.6 ppb for chloroform, 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, and tetrachloroethylene respectively, and their average levels were 31.1, 1.1, 2.1, 1.4, and 2.3 ppb correspondingly. The carbon tetrachloride, 1,1,1-trichloroethane, and tetrachloroethylene levels found in Tokyo were 2 to 10 times higher than the levels reported for Los Angeles.

52460 **APTIC NO. 74302**

Sueta, Shintaro and Kenichi Shimohara

SULFATE AND NITRATE CONCENTRATION OF AIR PARTICULATE MATTER IN KITAKYUSHU CITY. *(Kitakyushu-shi ni okeru fuyu funjin no ryusankon oyobi shosankon ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), (92):533, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 381.)*

Air samples in Kitakyushu-shi were collected by high-volume air sampler and analyzed for total dust, sulfate ion, and nitrate ion contents. Turbidimetry (with barium chloride) for sulfate ion and colorimetry (with 2,4-xylenol) for nitrate ion were used. Eight sampling stations were selected, seven of them located in an industrial area. The average atmospheric concentration level of nitrate ion at industrial stations ranged from 2.70 to 3.77 micrograms/cu m, and the sulfate level at these locations were between 15.9 to 23.7 micrograms/cu m except at one station. The average airborne dust concentration in industrial areas ranged from 163.7 to 226.1 micrograms/cu m, except for one station which showed 416.4 micrograms/cu m and also showed higher sulfate level than the other industrial stations (33.8 micrograms/cu m). The non-industrial station showed lower values for airborne dust, sulfate, and nitrate than the industrial stations. The monthly variations of sulfate and nitrate in airborne dust were very similar, although no clear trend of monthly variation was observed.

52461 **APTIC NO. 74303**

Yamada, Y., Y. Shima, T. Matsui, S. Hayakawa, N. Ito, M. Takatsuka, and M. Murata

STUDIES ON SUSPENDED PARTICULATES, PART 8. *(Fuyu funjin ni kansuru kenkyu, dai 8-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):526, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 374.)*

The concentration distributions of three kinds of particulate matter dust, sulfate ion, and nitrate ion, were studied using a high-volume air sampler. All three particles showed a logarithmic normal distribution. The 50% value of logarithmic frequency distribution of particle concentration was 136, 12.9, and 5.4 micrograms/cu m for dust, sulfate ion, and nitrate ion, respectively. The correlations for visibility with dust and sulfate ion concentrations were compared, and the correlation factors observed were - 0.610 for sulfate ion and - 0.627 for nitrate ion. A simultaneous air sampling was conducted at three different places, the particulate matters of these samples were analyzed, correlation factors were calculated. The correlation factors for dust and nitrate ion ranged from 0.893 to 0.976, indicating that these particles could be represented by a single sampling at one location. The correlation factor for sulfate ion, however, was poor, from 0.745 to 0.939, indicating a difference between locations.

52462 **APTIC NO. 74470**

Kanagawa Prefectural Government

POLLUTION STATUS CAUSED BY DUST FALL. *(Koka baijin ni yoru osen jokyo). Text in Japanese. In: Environmental White Papaer in 1974, p. 101-102, Dec. 1974.*

Average dust concentrations at Yokohama in 1973 ranged from 11.6 tons/sq km/mo in industrial areas to 6.4 tons/sq km/mo in industrial areas to 6.4 tons/sq km/mo in business-residential areas to 5.4 tons/sq km/mo in farm areas. The concentrations at Kawasaki ranged from 28.1 tons/sq km/mo in industrial areas to 15.1 tons/sq km/ mo and 9.6 tons/sq km/mo in the Kawasaki and Nakahara business-residential areas, respectively, to 8.2 tons/sq km/mo in farm areas. The concentrations have been markedly reduced since 1967, except those in farm areas. The yearly average airborne particulate concentrations measured at 42 locations including 8 at Kawasaki and 16 at Yokohama ranged from 0.151 mg/cu m at the Kasodai and Nagahama Sanitorium to 0.034 mg/cu m at the Kamakura Municipal Office. Average cadmium concentrations in air ranged from 0.055 micrograms/cu m at Daishi Elementary School to 0.005 micrograms/cu m at the Prefectural Industrial Research Institute, Nakamura Elementary School, and Fujisawa Municipal Office.

52463 **APTIC NO. 74515**

Itami City Office, Osaka (Japan)

MEASUREMENT BY AIR POLLUTION MONITORING CAR. *(Taiki osen sokuteisha ni yoru sokutei). Text in Japanese. Kogai no Gaikyo (The Outline of Pollution), vol. 1974:23-50, Dec. 1974.*

Measurements of air pollutants were conducted by continuous monitoring systems and air pollution monitoring systems and air monitoring cars at Itami city. The average sulfur oxides concentration measured by the lead dioxide at six monitoring stations in 1973 ranged from 0.52 to 0.24 sulfur trioxide mg/100/sq cm/day with an overall average of 0.36 SO3 mg/100/sq cm/day, which dereases from 0.41 SO3 mg/sq cm/day in 1972 and 0.60 SO3 mg/sq cm/day in 1971. The average dust concentration was 5.26 ton/sq km/mo in 1973, decreasing from 6.64 ton/sq km/mo in 1972. Airborne particulate concentration at the Social Economic Convention Hall ranged from 0.205 mg/cu m in April to 0.035 mg/cu m in January. The average carbon monoxide, nitric oxide and nitrogen dioxide concentrations at the same location were 3 ppm, 0.013 ppm and 0.026 ppm, respectively. Measurements by monitoring cars at 4 locations gave the highest sulfur dioxide concentration at 0.025 ppm from March 10 to March 16, 1973 at Kamizu Center. The highest airborne particulate concentration by the monitoring cars was 0.385 mg/cu m from May 24 to May 30, 1973 at the City Wholesale Market.

52464 **APTIC NO. 74650**

ANNUAL ACHIEVEMENT FROM JANUARY 1973 TO MARCH 1974 ON AIR POLLUTION PROJECTS. *(Nendo nai jisseki). Text in Japanese. Kyotoshi Eisei Kenkyusho Nenpo (Annual Rept. Kyoto Prefect. Inst. Public Health), no. 40:81-93, Oct. 1974.*

Air pollution measurements were carried out at Kyoto from Jan. 1973 to March 1974. Sulfur dioxide concentrations measured by the lead dioxide method ranged from 0.11 and 0.31 sulfur trioxide mg/100 sq cm/day in September to 0.30 and 0.48 SO3 mg/100 sq cm/day in April for industrial areas and residential areas, respectively. The average concentration for 14 locations in 1973 was about 17% lower than the eyar before. Dust concentrations measured at 11 locations by the deposit cage method were lower than the environmental standards of 5 tons/sq km/mo for business and residential areas and 8 tons/sq km/mo for the industrial area. Metal concentrations in air at the Minami Fire Department within the industrial area were: lead, 0.34-0.57 mg/cu m; cadmium, 0.008-0.011 mg/cu m; copper, 0.05-0.14 mg/cu m; nickel, 0.02-0.03 mg/cu m; manganese, 0.03-0.06 mg/cu m; chromium, 0.00-0.01 mg/cu m; vanadium, 0.03-0.13 mg/cu m; and zinc, 1.0-1.4 mg/cu m. The metal concentrations at residential areas were considerably lower. Nitrogen oxides concentrations in flue gases from 16 boilers and 5 waste incinerators were: 27-148 ppm for A heavy oil boiler; 147-252 ppm for C heavy oil boiler; 92 ppm for kerosene boiler; 24 ppm for urban gas boiler; and 91-177 ppm for incinerators.

52465 **APTIC NO. 74683**

Kanagawa Prefectural Government (Japan)

POLLUTED SITUATION BY CARBON MONOXIDE. *(Issanka tanso ni yoru osen jokyo). Text in Japanese. In: Environmental White Paper in 1974, 116-124, Dec. 1974.*

The national carbon monoxide emission standards are daily average of 1-hour concentration below 10 ppm and 8-hour average of 1-hour concentration below 20 ppm. Measurement results of 1973 at 28 locations in Kanagawa Prefecture showed that average CO concentrations ranged from 1.3 ppm to 3.3 ppm. At 78 locations in Yokohama city including some busy intersections, the average CO concentration ranged from 1.8 ppm to 23.5 ppm in 1972 and 2.9 ppm to 15.1 ppm in 1973. At 21 locations in Kawasaki city, the average concentration ranged from 1.7 ppm to 10.9 ppm and the highest 8-hour average was 23.3 ppm at Mizonoguchi. The highest 8-hour average in cities other than Yokohama and Kawasaki was 18.5 ppm at Chujitsuya in Zama city.

52466 **APTIC NO. 74684**

Meguro Ward Office (Japan), Construction and Public Nuisance Div.

ATMOSPHERIC SURVEY CONCERNING ENVIRONMENTAL POLLUTION AND WELL-WATER INVESTIGATION. *(Kogai ni Kakawaru Taiki no Chosa oyobi Idomizu Chosa). Text in Japanese. In: Survey Report on the Environmental Pollution, 1973, p. 27-71, Dec. 1974.*

Carbon monoxide concentrations were measured at 10 locations and lead concentrations at 2 locations in Meguro ward in Tokyo from April 1973 to March 1974 on a specific day each month. Air was sampled by vinyl bag with the aid of a pump and CO was analyzed by non-dispersive infrared spectrometry. The CO concentrations ranged from 11.3 ppm to 16.3 ppm on April 25, 1973, 2.7 ppm to 6.0 ppm on May 16, 8.0 ppm to 13.9 ppm on June 14, 13.0 ppm to 18.5 ppm on July 17, 11.2 ppm to 14.4 ppm on August 16, 13.7 ppm to 21.1 ppm on Sept. 18, 8.3 ppm to 12.9 ppm on Oct. 18, 10.0 ppm to 15.4 ppm on Nov. 16, 7.0 ppm to 10.5 ppm on Dec. 11, 5.6 ppm to 11.5 ppm on Jan. 17, 1974, 7.6 ppm to 12.0 ppm on Feb. 15, and 6.8 ppm to 10.6 ppm on March 19. The lead concentrations ranged from 0.83 micrograms/cu m on Aug. 16, 1973 to 5.8 micrograms/cu m on March 25, 1974. Wind direction and wind velocity as well as traffic numbers at times of measurement were also recorded.

52467 **APTIC NO. 74695**

EXAMINATION OF THE TREND OF GREATER AREA POLLUTION BY OXIDANTS. *(Okishidanto koichi osen keiko no kento). Text in Japanese. In: Report on the 1973 Tokyo-Kanagawa-Chiba-Saitama Cooperation Investigation on Photochemical Smogs. p. 71-103, April 1974.*

A large-scale oxidant pollution analysis was carried out for Tokyo, Saitama, Chiba, and Kanagawa in 1972 and 1973. The ground wind stream was analyzed for seven days at 800, 1000, 1100, 1200, 1300, 1400, 1500, and 1700 hr. Oxidant distribution charts were prepared for the same days, and the daily change in oxidant level was plotted for every individual monitoring station. Atmospheric stability was studied from weather condition curves obtained at 9 am. Wind velocity, maximum temperature, and visibility were also studied. A lingering sea wind front delayed the oxidant concentration peak but brought continuous high oxidant concentrations. Ground wind direction and atmospheric stability were te most important factors that determined the high oxidant concentrations in Tokyo and the Sagami gulf area. High oxidant concentrations occurred more frequently in northern Tokyo and Southern Saitama where sea and land winds converged. Automatic stability and sunlight were the most important factors that affected large-scale oxidant pollution.

52468 **APTIC NO. 74798**

Itami City Office (Japan) Osaka Prefecture

PRESENT STATUS OF AIR POLLUTION. *(Taiki osen no genjo). Text in Japanese. Kogai No Gaikyo (The Outline of Pollution), vol. 1974:19-22, Dec. 1974.*

The results of pollutant measurements taken in 1973 for Itami City, Japan, are summarized. Measurements are made on sulfur oxides, precipitated particulates, airborne particulates, wind direction and velocity, temperature, humidity, precipitation, carbon monoxide, nitrogen oxides, and photochemical oxidants. The annual average carbon monoxide emissions met environmental standards (issued May 8, 1973). The amounts of airborne particulates met 69.8% of the environmental standards. Revised environmental standards (of May 16, 1973) for sulfur dioxide were met 77.9% of the time. High concentrations (over 0.041 ppm) of sulfur dioxide occurred more than twice as often during the day (7 am-7 pm) as at night. Concentrations of atmospheric nitrogen dioxide (NO2) met environmental standards (issued May 8, 1973) only 31.0% of the time. Nitric oxide (NO) emission from automobiles reached a high yearly average of 0.177 ppm, probably because measurements were taken where there was heavy automobile traffic. The yearly average value for photochemical oxidant was 0.022 ppm, with the highest values occurring during October-December (0.026-0.031) ppm). Photochemical smog forecasts occurred twice in August. The amounts of precipitated particulates ranged from 4.0-6.5 tons/sq km/mo. Wind direction is primarily from the NNW, for the entire year except July and August. The yearly average wind velocity was 2.5 m/sec. The average annual temperature was 19.2 C; average annual humidity was 61%; and the most rain fell in April (230.2 mm).

1973

52469 **APTIC NO. 74909**

Matsuda, M., BY. Ban, M. Miyamoto, S. Kobayashi, M. Yanami, Y. Fuchi, and T. Masuda

AIR POLLUTION SURVEY IN NAGASAKI PREFECTURE (REPORT 4). *(Nagasakiken ni okeru taiki osen chosa seiseki). Text in Japanese. Nagasaki-ken Eisei Kogai Kenkyusho-ho (Rep. Nagasaki Prefect. Inst. Pub. Health), no. 13:16-20, 1973.*

Air pollution monitoring in Nagasaki Prefecture during 1973 for dust and sulfur oxides is reported. Dust was collected in dust jars; and its quantity, pH, water soluble and in-soluble constituents, trapped liquid, and residue after incineration were measured. There were 13 monitoring points at three locations (Omura, Tohi, and Kitamatsu). The arithmetic average pH ranged from 4.4-6.6; the annual average was 5.3-5.5, showing very little variation. While Omura showed great monthly, fluctuations, Tohi did not. Although the volume of dust varied considerably at each area, the same tendencies as in the preceding year were observed. At Omura and Kitamatsu, there was a correlation between residue after incineration and the volume of dust; but at Tohi, there was no such correlation. Sulfur oxides were measured by the lead dioxide method. The monthly average was less than 0.5 mg sulfur trioxide day/100 sq cm PbO2. There was a slight increase over the preceding year. Of the three areas, levels at Kitamatsu were the lowest, and those at Omura were the highest. At all three places, the levels for July were the highest. Dust volume averaged 5.23, 3.88, and 3.31 tons/sq km/30 days. Residues after incineration 2.90, 1.67, and 1.58 tons/sq km/30 days. Sulfur oxides, were 0.23, 0.17, and 0.28 mg SO3/day/100 sq cm PbO2.

52470 **APTIC NO. 74402**

Saito, Koichi

AUTOMOTIVE EXHAUST GAS. *(Jidosha haiki gasu). Text in Japanese. Annu. Rept. Environ. Pollut. Res. Cent. Ibaragi-ken, no. 6:94-99, 1973.*

Carbon monoxide concentrations were measured at three key traffic points in Mito, Tsuchiura and Shimodate. Data obtained with a continuous analyzer during the period June 1973 to March 1974 were compiled and analyzed. The number of days when CO concentrations exceeded the environmental standard (24-hour average of 10 ppm, 8-hour average of 20 ppm), the emergency standard (1-hour value of 30 ppm), and the extreme emergency standard (one hour value of 50 ppm) was zero. The yearly average, maximum daily average, and maximum 1-hour average values (ppm) were 4.5, 9.0 and 24.0, respectively, for Mito, 3.3, 6.4 and 17.0, respectively, for Tsuchiura, and 2.5, 6.5 and 21.0, respectively, for Shimodate. The diurnal variations showed peaks at morning and evening rush hours, indicating a typical pollution pattern due to automotive exhaust emission. The monthly variation in CO concentration was slight; however, the average value was slightly higher in the winter as compared to the summer.

52471 **APTIC NO. 74660**

Yamane, Yasuhiro and Motoichi Miyazaki

STUDIES ON NICKEL AS AN AIR POLLUTANT. *(Taiki osen busshitsu to shite no nikkeru ni kansaru kenkyu). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Environ. Sci. Res. Rep., Chiba Univ.), 1(1):79-85, July 1973. 27 refs.*

Nickel and its compounds cause many respiratory tract and skin ailments. Consequently, attempts were made to determine amounts of nickel in the environment of the Kyoba industrial area. Soot deposit samples were taken monthly from Feb. 1967 to Oct. 1968 at three locations in Chiba, four locations in Ichihara, and one location in Ichikawa. Sampling details for the above are published elsewhere. Airborne dust particulate samples were taken at Chiba Univ. and the Old Ichihara City Hall building. The airborne dust particulates were collected by means of a Low-Volume Air Sampler operating monthly at a rate of 30 l/min over a period of one week, from Oct. 1971 to Jan. 1973. The amounts of Ni in the soot and airborne particulate samples were determined by atomic absorption methods and absorption photometric methods, after suitable ashing and final extraction with (1 + 1) hydrochloric acid and 30% hydrogen peroxide. There were seasonal changes in the amount of Ni found in a particular location. Seasonal changes in the wind direction can account for the variations. Analysis of the dust and soot samples for other metals further pinpointed the sources of pollution--steelworks in Chiba City, and the industrial areas near the sea, where much heavy oil is used.

52472 **APTIC NO. 76678**

Zavodsky, Dusan and Alfonz Juck

DISPERSITY OF THE ATMOSPHERIC AEROSOL IN THE SURFACE LAYER IN BRATISLAVA. *(Disperzita atmosferichkeho aerosolu v prizemnej vrstve v Bratislave). Text in Slovak. Meteorologicke Zpravy, 27(1):16-18, Jan. 1973. 7 refs.*

The average diameter and standard deviation of diameters of solid particles of atmospheric aerosol were computed from samples obtained from the surface layer of the atmosphere in the Bratislava-Kotliba region between January and November of 1970. A total of 10 samples were obtained with a membrane filter at rates of 2-3 cu m/hr. Slides for an electron microscope were prepared and photographed. Each calculation was based on the size measurement of at least 1000 particles in 10 independent microscopic fields of view. The average diameters varied from 0.19 to 0.73 micron. The values were substituted into a logarithmic-gaussian distribution formula, and the results were plotted on logarithmic probability paper. All plots were straight lines, indicating that the distribution of particle sizes of the atmospheric aerosol was a gaussian-logarithmic function.

52473 **APTIC NO. 74539**

Suita Municipal Office, Osaka (Japan)

WHITE PAPER ON THE ENVIRONMENTAL POLLUTION IN 1973: PRESENT STATUS AND COUNTERMEASURES FOR AIR POLLUTION. *(Kogai hakusho: Taiki osen no genkyo to taisaku). Text in Japanese. 129p., March 1973.*

The present status of air pollution in Suita city is reviewed with 1973 measurement data of sulfur oxides (yearly average, 0.33-0.91 mg sulfur trioxide/100 sq cm/day), suspended particulate (0.054-0.065 mg/cu m), oxidant, (0.042 ppm, catbon monoxide (1.6 ppm), hydrocarbons (1.20-1.35 ppm) nitrogen oxides, (0.06 ppm), and settling particulates (2.7 ton/sq km). A description of measurement methods and a map of measurement points are given with the data obtained. The 1973 data and data obtained since 1967 are analyzed in terms of yearly variation and monthly variation and with reference to the new environmental standard. The data on SOx, dust, oxidants, nitric oxide, nitrogen dioxide, CO, and HC concentrations measured by mobile measurement vehicles are also compiled and analyzed. To investigate the pollution by automotive exhaust gas, pollutant concentrations were measured along major highways, and the relationship between traffic volume and pollutant was analyzed. Data on consumption of fuel and sulfur dioxide emission quantity were compiled and the correlations were analyzed. The air pollution countermeasures for each pollutant, control by plant inspection, automotive exhaust gas control measures and photochemical smog control measures are also described.

1972

52474 **APTIC NO. 74756**

Kondo, J.

AIR POLLUTION CONTROL SYSTEM IN CASE THERE ARE MULTIPLE POLLUTION SOURCES. *(Osengen ga tasu aru baai no taiki osen boshi shisutemu). Text in Japanese. Enjiniyasu (Engineers), no. 292:30-32, Dec. 1972.*

Japanese efforts to monitor and control air pollution are reviewed. An air pollution monitoring system in Tokyo is described. Since 1965 the average concentration of sulfur oxides has decreased gradually. It was obligatory for stacks to be equipped withh dust removal equipment since 1969. Signboards to Tokyo show the noise and carbon monoxide level. Estimates of the rate of air pollution contribution are described for the Nishiyodogawa area in Osaka. A survey of air pollution in the Nagoya area is also described. Diffusion from high stacks inn the coastal area is discussed. Forecasting of air pollution by wind tunnel experiments and comparisons with on-site data are reported for 40 industrial sites in Japan; tracer methods were used. Air pollution modelling for high air pollution conditions in New York City is discussed. Air pollution control technology for multiple sources is discussed on a regional basis.

52475 **APTIC NO. 74852**

Suzuki, S.

SUMMING UP PHOTOCHEMICAL REACTION. *(Kokagaku hanno o matomete). Text in Japanese. Enijiniyasu (Engineers), no. 292:26-29, Dec. 1972.*

Topics dealing with photochemical reactions are reviewed. Subjects covered include: smog monitoring data for Japan in general and for Tokyo and Osaka in particular, the acrolein theory, photochemical smog from automobile exhaust, stationary and mobile smog chambers, the reaction of oxidants with sulfur dioxide, the change in atmospheric aromatic hydrocarbons over the last 10 yr, and changes in the components of automobile exhaust.

1971

52476 **APTIC NO. 74616**

Nenquin, G., G. Fally, and J. Samain

AIR POLLUTION STUDY IN THE MONS REGION BY MEANS OF DEPOSIT GAUGES AND DIEM TEST PLATES. *(Etude de la pollution atmospherique dans la region de Mons a l aide des jauges de depot et des plaquettes Diem). Text in French. Bull. Tech. Secur. Salubrite, Inst. Nat. Ind. Extr., no. 4:3-14, Sept. 1971.*

Results of gaseous and particulate pollutant concentration measurements, conducted systematically since 1968 in the Mons region, accommodating large cement-works in Belgium, are presented. Owen s gauges permitting the determination of dust fall, sulfur dioxide and nitrogen oxides adsorbed in water, and vaseline-coated Diem plates were used for the monitoring at each of the 30 stations. At Mons, considerable dust settling ranging from 0.5 to 2 g/sq m day was measured by means of Diem plates, especially in periods of dry weather and northwesterly winds. The sulfate ion content in rain water was between 0.04 and 0.06 g/sq m/day. At Obourg, which is polluted when the winds blow from the southwest, it was the deposit gauges which revealed the highest levels of pollution. In dry weather, Diem plates give more accurate values for settling dust than do Owen gauges.

1969

52477 **APTIC NO. 74553**

Bureau of Public Health, Kobe City (Japan)

REPORT ON THE INVESTIGATION OF AIR POLLUTION IN KOBE CITY. PART XI. *(Kobe-shi taikiosen chosa kenkyu hokoku dai 11-ho). Text in Japanese. 23p., March 1969.*

Air pollution in Kobe, Japan during 1968 is reported. The amount of dust fall was high in June and August, and the annual mean value was 9.03 ton/cu km/mo. The amount of suspended particles per hr showed a diurnal peak from 7 am-10 am. Annual fluctuations of sulfur dioxide concentration were slightly increased compared with those of the past 4 or 5 yr which showed a decreasing tendency. In March and November, SO2 concentration was increased over the surveyed district, indicating that the district was exposed to heavy pollution. Sulfur dioxide concentration (measured by an electric conductivity method) showed a high value in November and showed a diurnal peak at 10 am. Concentrations over 0.1 ppm frequently appeared when the wind direction was east-southeast-south and the wind velocity was below 2.5 m/sec. Concentrations of sulfur oxides in excess of the environmental standard were observed at many measuring points, indicating the necessity of countermeasure in the future.

ATMOSPHERIC INTERACTION

1975

52478 **APTIC NO. 74639**

Becker, Karl-Heinz and Ulrich Schurath

THE INFLUENCE OF NITROGEN OXIDES ON ATMOSPHERIC OXIDATION PROCESSES. *(Der Einfluss von Stickstoffoxiden auf atmosphaerische Oxydationsprozesse). Text in German. Staub, Reinhaltung Luft, 35(4):156-161, 1975. 12 refs.*

The photochemically active component of sunlight, which leads to NO2 photolysis in the atmosphere, was measured continuously and on an absolute scale with a newly developed instrument. A good correlation was found between the values of total daily radiation and the daily maxima of the ozone concentration in Bonn, which was also recorded continuously. In light of these measurements and on the basis of a simplified reaction model, the crucial influence of nitrogen dioxide on the formation of atmospheric oxidants, especially ozone, was explained and supported by measurements in a smog chamber and by a model calculation.

52479 **APTIC NO. 74955**

de Bary, E.

THE INFLUENCE OF ABSORPTION ON SKY RADIANCE. *(Der Einfluss der Absorption auf die Strahldichte des Himmels). Text in German. Beitr. Physik Atmosphaere, 48(1): 95-102, 1975. 6 refs.*

Eschelbach s computation of sky radiance values (1973) were used to reduce sky radiance measurements to aerosol scattering functions. The measurements were carried out on top of Hopenpeissen Mountain, and the empirical values were compared with theoretical values, which were based on specific models of aerosol particle size distribution. A satisfactory agreement between theory and experiment was found only under the assumption of power law size distributions, and by taking into account the aerosol absorption according to the measurements made by Fischer (1972).

52480 **APTIC NO. 74966**

Fukutomi, J., T. Watabe, K. Nakase and Y. Yamamoto

EXPERIMENTAL STUDY ON THE DIFFUSION MODEL OF AIR POLLUTION. *(Taiki osen no kakusan moderu jikken). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 61-64, 1975. (Presented at the Japan Society of Mechanical Engineers, Lecture Meeting, Tokyo, April 1-3, 1975.)*

A 700 mm by 3000 mm suction type wind tunnel, installed with round sticks and a vinyl sheet to obtain a turbulent boundary layer of 200-250 m in thickness and with 50 mm hill to simulate 200 mm high, two-dimensional hill, was used for an air pollution diffusion study. Wind was introduced at 2 m/s, and wind velocity distribution and turbulent flow distribution were measured by hot stream flow meter with an x type probe. A breakaway vortex flow formed behind the hill and extended as an ellipse to the rear approximately 7 times the height of the hill. The passing line of the vortex flow became the boundary of the vortex flow region and was identical with the turbulent flow and Reynolds stress peak locus. The diffusion coefficient behind the hill was about 10 times that in front of the hill.

52481 **APTIC NO. 74926**

Hayashi, Masayasu

ESTIMATION OF ATMOSPHERIC POLLUTION. I. *(Taiki osen suitei no ichi-hoho. I.). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 53, 1975. (Presented at the Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

Studies of the annual average atmospheric pollution were made with meteorological data. The diffusion distribution of smoke discharged from a chimney was expressed by the Bloom equation and the height of the chimney was calculated from the Moses-Carson equation. The equations were used to simulate the atmospheric pollution in the Kashima district of Ibaraki Prefecture in 1972. The data used were the concentration of sulfur dioxide, conditions of the discharge of smoke, and meteorological conditions. For the stability classification, the cloudiness at Choshi was used with the the aid of a conversion table; no data were available for the amount of sunshine. For the determination of sulfur oxides, a number of small smoke origins contributed to the formation of the background. The average sulfur oxide concentration was calculated for days when the winds blew from the land to the sea. The values were 0.018 ppm at the center of an industrial area and 0.015 ppm in the surrounding area. The average concentration distribution was obtained from 10-20 observations and was compared with the results of the simulation.

52482 **APTIC NO. 74978**

Herman, B. M., R. S. Browning, and J. J. De Luisi

DETERMINATION OF THE EFFECTIVE IMAGINARY TERM OF THE COMPLEX REFRACTIVE INDEX OF ATMOSPHERIC DUST BY REMOTE SENSING: THE DIFFUSE-DIRECT RADIATION METHOD. *J. Atmospheric Sci., 32(5):918-925, May 1975. 37 refs.*

A method for determining the complex part of the index of refraction of atmospheric dust by utilizing remote measurements of diffuse and direct solar radiation is outlined. The solution requires the comparison of the ratio of diffuse to direct solar radiation obtained from measurements with theoretical calculations of the same parameters. A knowledge of the ground albedo is necessary for the solution. The ground albedo may also be determined from the measured ratios, but the solution in this case is more sensitive to measurement than when the ground albedo is known. The solution for the effective refractive index of dust also yields the absorption of solar radiation by the atmosphere. Additional observations of the vertical distribution of dust, for example with laser radar, can further be used to infer the vertical distribution of heating. (Author abstract modified)

52483 **APTIC NO. 76735**

Mizuma, Mitsuo

ANALYSIS OF THE CONCENTRATION FIELD OF ATMOSPHERIC POLLUTION BY THE METHOD OF VARIATION. *(Henbun-ho ni yoru taiki osen nodo ba no kaiseki). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 54, 1975. 3 refs. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

The analysis of the concentration field of atmospheric pollution was investigated. Sulfur oxide concentration data was obtained from the environmental pollution monitoring network of Osaka Prefecture. The concentration of SOx was adopted as an independent variable. Observational limiting conditions, the linear flow of polluting materials, and the simple low-pass filter were adopted as dynamic limiting conditions of the general function. An analytical equation was obtained in the differential form. A comparison of the theoretical results with those obtained by observation resulted in unsatisfactory agreement. A discussion on the effect of introducing dynamic limiting conditions into the general function is presented.

52484 **APTIC NO. 74390**

Moriguchi, Minoru

CALCULATION METHOD FOR THE REGULATION OF SOX TOTAL EMISSION. *(SOx soryo kisei no santei hoho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(5):773-811, 1975.*

The calculation method for the permissible total sulfur oxides emission quantity adopted by the Total Emission Control Technical Committee of the Environment Agency is described. The basic concept of total emission quantity calculation is discussed with calculation procedures (preliminary calculation, estimation calculation based on the preliminary calculation and calculation of control values). The subjects discussed are the scope of the calculation, handling of flue gas emission source data, effective stack height (Bosanquet equation, Moses and Carson equation), atmospheric stability and instability (CONCAWE equation, Briggs equation), meteorological data (model simulation), diffusion models (D. H. Lucas diffusion model), normal diffusion equation, estimation equations for long-term average concentration (Puff model), diffusion from plane sources, calculation using measured concentration data, estimation of diffusion parameters (Singer et al s method), Pasquill stability classification, use of maximum gradient method, background calculations, and evaluation of the adequacy of diffusion models. The estimation calculation step, determination of environmental target values, and the calculation step of control values are described with reference to linear programming.

52485 **APTIC NO. 74992**

Nishioka, Akio

BLOCKING OF GROUND ATMOSPHERE: ITS FORMATION AND INFLUENCE. *(Setchi taiki no burokku-ka: sono seisei to eikyo). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo, p. 44-45, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

The formation of blocks of air of various temperatures in urban situations was investigated. Diffusion equations alone are insufficient for providng an accurate description of atmospheric pollutant behavior in urban areas. When wind velocities are below 3-4 m/sec, pockets of high and low pollutant concentrations occur, depending on wind direction. Enormous artificial heat sources, such as the industrial complex in Yokkaichi City, produce blocks of high temperature air (several 10-100 m in size), which travel as a unit for several km. The movement of air blocks was followed for a 24-hour period in December 1971 in Atsumi City, Aichi Prefecture, Japan. Blocking phenomena were more pronounced during the night, but were discernable in the daytime, when wind velocities were low. In Atsumi City, blocking disappeared, not because of stronger winds, but more because of the influx of ocean air with a high level of uniformity in temperature.

52486 **APTIC NO. 74802**

Ogawa, T.

ALTITUDINAL DISTRIBUTION OF MINOR CONSTITUENTS IN THE STRATOSPHERE. *(Seisoken biryo seibun no kodo bunpu). Text in Japanese. Tenki (Weather), 22(5):215-226, May 1975. 40 refs.*

The minor constituents in the stratosphere are one of the factors governing the heat balance of the atmosphere. Ozone absorbs solar radiation and is the primary heat source for the stratosphere and mesosphere and carbon dioxide and water vapor play important roles in heat transfer in the atmosphere. The roles of other minor constituent are secondary. Nitric oxide, nitrogen dioxides, and hydrogen govern the decomposition of O3, and methane and hydrogen govern water formation and affect the density of O3 and H2O. The theoretical development in minor constituent distribution is reviewed. A first order model based on photochemical reaction and vertical eddy diffusion is evaluated in relation to the vertical distribution of minor constituents. The model calculation method, calculation results, and vertical distribution of O3 are described. The calculation results are compared with measured values. The effect of SST exhaust gas on O3 is also discussed.

52487 **APTIC NO. 74871**

Ogawa, Toshihiro

THE FORMATION OF NOX IN THE STRATOSPHERE. *(Seisoken ni okeru NOx no seisei). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 134, 1975. (Presented at the Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

The concentration of nitrogen oxides in the stratosphere is only 0.1-1 ppb; however, it plays an important role in the disappearance of ozone. Nitrogen oxides are formed in the stratosphere by the reaction between nitrous oxide and oxygen. The semi-stable activated ozone, which oxidizzes N_2O, is formed by the photodecomposition of ozone. Nitrous oxide originates via the liberation of this compound by microorganisms living in the earth. Another possible source of NO_x is the reaction of atomic oxygen, hydroxyl radical, and molecular oxygen with di- and mono- hydronitrogen formed by the oxidation of ammonia which is also present in air. Cosmic rays also play some role in the formation of NO_x; namely, they dissociate or ionize nitrogen molecules. According to one theory, the amount of NO_x liberated into the air from the biosphere is as much as 370 million tons/yr, as NO_2. Of this amount, about 50 million tons of NO_x results from human activity. Therefore, human activity plays a very important role in the formation of NO_x. The disappearance of NO_x, however, takes place pretty rapidly, for example, within several days. The amount of NO_x formed in the stratosphere is about 1 million tons/yr.

52488 **APTIC NO. 74974**

Okamoto, Shinichi, Kiyoshige Shiozawa, and Atsushi Otaki

SIMULATION OF ATMOSPHERIC POLLUTION BY THE DIFFUSION MODEL. II. *(Kakusan model ni yoru taiki osen no simulation. II.). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 55, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

Diffusion models were used to calculate sulfur dioxide concentrations in the Tokyo-Yokohama area of Japan. The results of the calculations were examined particularly for 1-hour values. The models used were the Bloom equation of the normal type (when the wind velocity was not zero) and the integral Buff equation (during calm winds). The concentration calculations were made for (16 wind direction, three wind velocities plus one calm), and three stability conditions (daytime, cloudy daytime, and night). The correlation coefficient and the error distribution were almost definite, irrespective of the point of observation, with respect to the wind direction and velocity. Better results were obtained for the upper limit wind velocity of 1.0 m/sec. than for 0.5 m/sec. The results were too large at the Kawasaki, Tsurumi, and Kanagawa districts when the wind direction was between east and northeast. The root mean square of the error distribution increased as the average value increased; therefore, it is not advisable to adopt the RMSE alone for the estimation.

52489 **APTIC NO. 74786**

Oshima, K. and A. Nagakura

A METHOD OF AIR POLLUTION CONTROL. *(Taiki osen seigyo no ichi hoho). Text in Japanese. Seisan-Kenkyu (Prod. Res.), 27(3): 136-138, March 1975. 2 refs.*

An evaluation function J was given as a second order differential equation for optimum pollution control. The equation was derived based on the assumptions that variation of pollutant concentration from standard value was a loss and that emission was proportional to the degree of operation activity. The relation between pollutant concentration and emission was given by Fick s partial differential equation for diffusion. The unknown diffusion coefficient and wind velocity in Fick s equation were obtained om data acquired at monitoring stations. A computer simulation was carried out for an assumed case with four emission sources and 4 monitoring stations, and satisfactory results were obtained.

52490 **APTIC NO. 76663**

Otaki, Atsushi, Kiyoshiga Shiozawa, and Shinichi Okamoto

STATISTICAL PREDICTION OF THE CONCENTRATION OF ATMOSPHERIC POLLUTENTS. IV. ESTIMATION OF CONCENTRATION BY THE WEIGHTED MOVING AVERAGE AND SELF REGRESSION MODEL. *(Taiki osen busshitsu nodo no tokeiteki suitei hoshiki (Dai 4 po). Kaju ido heikin to jiko-kaiki model ni yoru nodo suitei). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 57, 1975. 34 refs. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

A self regression model was used to predict the concentration of atmospheric pollution under circumstances where the data are incomplete. The time variation of the pollutants was also taken into consideration. A method for predicting the pollution concentration was proposed and the concentration of sulfur oxides was estimated at a point in the Keihin industrial district. Comparison of the estimated values with measured values indicated that the weighted moving average series showed a self correlation function which was possibly a random variation. Some lag was present in the phase of the concentration curve. The predicted values were a little ahead of the actual concentrations measured afterwards.

52491 **APTIC NO. 74634**

Reiter, Elmar R., W. Carnuth, H. -J. Kanter, K. Poetzl, Reinhold Reiter, and R. Sladkovic

MEASUREMENTS OF STRATOSPHERIC RESIDENCE TIMES. *Arch. Meteorol. Geophys. Bioklimatol., Ser. A (Vienna), 24(1):41-51, 1975. 14 refs.*

Activity ratio measurements for P32/Be7 were obtained on Zugspitze Mountain in the Bavarian Alps under conditions of stratospheric air intrusions near jet streams. There appeared to be a seasonal trend to such residence times, yielding a median value of greater than or equal to 36 days during the spring and greater than or equal to 17 days during the fall.

52492 **APTIC NO. 74632**

Reiter, R. and W. Carnuth

COMPARING LIDAR REFLECTIVITY PROFILES AGAINST MEASURED PROFILES OF VERTICAL AEROSOL DISTRIBUTION BETWEEN 1 AND 3 KM A.S.L. *Arch. Meteorol. Geophys. Bioklimatol., Ser. A (Vienna), 24(1):69-92, 1975. 44 refs.*

A system which permits the systematic comparison of Lidar reflectivity and aerosol concentration, as well as aerological data, is described. Results are discussed using simultaneously obtained Lidar reflectivity profiles and profiles of aerosol concentration (condensation nuclei), in addition to temperature and humidity lapse rates. Very good agreement was found between Lidar reflectivity and the logarithm of the number of condensation nuclei. With high relative humidities some influence of the growth of the particles was noted, which, however, was not sufficient to describe Lidar reflectivity profiles.

52493 **APTIC NO. 74564**

Sano, S.

THE CHANGE OF POLLUTANTS, ESPECIALLY ODOROUS SUBSTANCES, IN THE ATMOSPHERE. *(Osen butsu, tokuni akushu, no taiki chu ni okeru henka). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(19):3-7, March 1975. 7 refs.*

Sulfuric acid mist appears under various conditions. Under sunlight conditions, sulfur dioxide gas combines with atmospheric oxygen to form sulfur trioxide which in turn combines with water to form sulfuric acid. By the catalysis of solid particles, SO_2 is also oxidized. In the presence of fog particles, especially those containing salts, SO_2 is also easily oxidized. Amines and ammonia, which are odorous, combine with sulfuric acid in air to form ammonium sulfate. The odorous substances discharged from pulp factories are hydrogen sulfide, dimethylsulfide, and dimethyl disulfide. Various substances are formed by the photodecomposition of DMS. These include methane, dimethyldisulfide, and other sulfur compounds. Dimethylsulfide gives methane, thioformaldehyde, methyl mercaptan, and DMDS via photosensitization by mercury. Dibenzylsulfoxide is obtained by the reaction between an alcoholic solution of dibenzylsulfide and oxygen. Dimethylsulfide is oxidized especially easily when it is irradiated with ultraviolet light in air. The oxidation products are mostly less volatile than DMS, and this method is possibly useful for the elimination of odors in the exhaust of pulp factories.

52494 **APTIC NO. 74742**

Sasagawa, T.

WEATHER CONDITION AND ENVIRONMENTAL POLLUTION IN KAWASAKI. *(Kawasaki no kisho to kogai). Text in Japanese. Kanagawa no Shizen (Kanagawa Nature Conservancy), no. 25:7-8, Feb. 1975.*

The major emitters of sulfur oxides and nitrogen oxides in Kawasaki are the large plants in the seaside area. Forty seven large plants in the area consumed 96%, or 940,000 kl, of the total heavy oil consumption of the city and emitted 92,325 tons of SOx anu 39,950 tons of NOx from Sept. 1970 to Aug. 1971. The average nitrogen oxide concentration measured at 22 locations from July 7 to July 14, 1973 were as high as 0.12 ppm at Sugayo. A NNW wind predominated in winter while S and SE winds predominated in summer. Ground inversions of temperature occurred frequently at night during the winter. The maximum height of the inversion layer was about 200 m on plain areas and 20 m on hilly areas.

52495 **APTIC NO. 74841**

Sato, I.

PHOTOCHEMICAL OXIDANT AND THE WEATHER: FROM 15TH AIR POLLUTION RESEARCH CONFERENCE. *(Kokagaku Okishidanto to kisho (Dai 15 kai taiki osen kenkyu zenkoku kyogi taiki kara)). Text in Japanese. Osaka Kanku Kishodai Gijutsu Jyoho (Tech. Rep. Osaka Dist. Meteorol. Obs.), no. 15:24-31, March 1975.*

The relationship between photochemical oxidant pollution and meteorological variables is reviewed. Investigations in Kanagawa Prefecture have shown that high ozone concentrations correspond to the upper limit of sea wind, and the highest concentration occurs at a height which coincides with the loitering zone of wind. A convergent zone is observed at 500-600 m in the morning and at about 600 m in the afternoon in the Yokohama-Kawasaki area. High ozone concentrations are detected at 500-700 m in the afternoon. Studies at Kyoto reveal that the ozone concentration increases with increasing altitude to a certain height, without an extremely high concentration of ozone. About 50% of the photochemical oxidant warnings in 1973 in Kanagawa were issued on days with a maximum mixing depth of 700-1000 m, and 40% were on days with a MMD of 1000-1600 m. A flow chart for forecasting oxidant concentration is proposed, using such factors as precipitation at 9 am, nitrogen dioxide concentration at 9 am, wind velocity at 9 am, the highest predicted temperature, and predicted wind direction.

52496 **APTIC NO. 74457**

Seki, Kiyonobu

TRIAL CALCULATION OF THE PASQUILL STABILITY. *(Pasquill anteido no shisan kekka ni tusite). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 52, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

The table of stability of Pasquill is expressed by a mathematical equation involving the wind velocity, the height of the sun, the amount of cloud cover cloud shape, amd weather conditions. For the daytime, pp 52.5p equals 2.5 q(1 - 0.1N) - 41.8v + 90.0. For the night, tan(57 - 0.5pp - 4.5p) equals 2(V -1)/(12 - N), where p is the stability with c equal to O, q is the height of the sun, V is the wind velocity, and N equals M/2 + L. M and N are the amounts of middle and lower layer clouds. These parameters were measured at Yokohama and were substituted into the equations. A noncontinuous change was present in addition to seasonal and systematic changes. It was also possible to calculate the stability at a particular location, for example, the examination of exhaust gas diffusion at the Manazuru bypass road.

52497 **APTIC NO. 76743**

Seki, Kiyonobu

METEOROLOGICAL ANALYSIS AND ESTIMATION OF THE SO-CALLED ACIDIC RAIN. *(Iwayuru sansei ame no kishoteki kaiseki to yosoku). Text In Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 48, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

In order to avoid damage brought about by acidic rain which ataacked the northern Kanto district on July 3rd, 1974, forecasting methods were investigated. Although the study conducted for several months, no definitive results were obtained. However, warnings will be issued when the following conditions are satisfied: fog appears at 9 o clock in the morning; the wind blows from the northeast; a warm front is present at 9 am 220 km to the south of Kanagawa Prefecture; the inclination of the warm front is about 1/100; an isothermal layer or an inversion layer is present in the mixed layer at 9 am; the lower part of the mixed layer is not absolutely stable; the upper layer of the mixed layer is unstable under particular conditions; a warm front is present 40-100 km to the north of the prefecture in the daytime; and the relative humidity is more than 85% in the daytime. This scheme is based on observations made within a limited period, and revisions will be made when new information is obtained.

52498 **APTIC NO. 74743**

Shirayama, Hajime and Yukio Aburamoto

ON AIR POLLUTION AND METEOROLOGICAL PHENOMENA - THE STUDY OF THE RELATIONSHIP BETWEEN INVERSION LAYER AND DUST LAYER. *(Taiki osen to kisho, kion gyakotenso to dasutoso tono kankei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(3):69-77, 1975.*

Investigations of inversion layers and dust layers were conducted in spring 1975 at the Toyama Bay industrial area. Vertical distributions of temperature and wind to 2000 m in height were analyzed, and inversion layers were studied from 5:3 am on May 13 and May 14. Dust layer and smoke stream were studied by laser radar. Temperatures were recorded at 100 m intervals below 500 m and at 300 m intervals from 500 m to 2000 m, by using a lift balloon rising at a speed of 5 m/sec. A strong ground inversion layer of 2 C/100 m was observed on May 13 at 5:30 am up to 250 m and on top of the inversion layer, followed by a stable layer up to 500 m and a neutral layer up to 2000 m. At 7:00 am, a neutral layer up to 50 m and then a strong inversion layer up to 100 m were observed. At 9:00 am, an unstable layer to 25 m and a weak inversion layer to 150 m were recorded. Dust layers ranged from 75 m at 5:45 am to 173 m at 7:45 to 195 m at 9:20 am on May 13. At 9:30 pm, the dust layer reached 340 m in height.

52499 **APTIC NO. 74662**

Tajima, Takatoshi, Moritsugu Kitamura, Yasuyuki Tajima, and Eikichi Kawashima

REMOVAL OF ATMOSPHERIC SO2 BY RAIN DROPS. *(Taiki chu no SO2 no kou ni yoru jokyo ryo ni tsuite). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(3):152, 1975.*

Removal of sulfur dioxide in the air by rain was studied starting in 1968 in Ishikawa Prefecture. Deposition gauges were placed at various locations and the chemical composition of rain water and dry deposition material were analyzed. Excess sulfate was calculated from sulfate to rain, chloride in rain, and the two ions in sea water. The total emission of SO_2 in Kanazawa city in 1968 was 4517 tons and 1132 tons were removed by rain. The total emission was 6992 tons in 1973 and 1481 tons were removed by rain. The rates of removal by rain from 168 to 1973 ranged from 25.9% in 1972 to 19.9% in 1970. Excess sulfate in rain increased with increasing total SO_2 emission, and the rate of removal increased with increasing pollution level. The concentrations of chemicals in rain were related to the particle size of rain drops, and tne pH value of rain depended primarily on sulfate ion concentration.

52500 **APTIC NO. 76736**

Takeuchi, Kiyohide and Fujio Kimura

SIMPLIFIED EULER TREATMENT OF THE DIFFUSION EQUATION AND ITS APPLICATION TO TOKYO AREA. *(Kakusan shiki no kani Euler teki toriatsukai to sono Tokyo chiho eno tekiyo). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 59, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

A simulation of nitrogen oxide and sulfur dioxide air pollution was made using the three-dimensional model of the Euler diffusion which gives numerical solutions relatively easily. The relationship between meteorology and air pollution was examined. The simulation was also developed for photochemical smog by using a photochemical reaction model already proposed. The factors treated were: the pollutant concentration, the diffusion coefficients in the perpendicular and vertical directions, the exhaust intensity of the pollutants, and the amount of pollutants formed by reactions. The Eschenroeder model which consists of 12 reactions was adopted. A semi-stationary approximation was applied to oxygen, hydroxylradical, oxygenated hydrocarbons, and nitrous acid. The diffusion equation was solved for nitric oxide, nitrogen dioxide, ozone, and hydrocarbons. Pollution data were obtained for the city of Tokyo. Fixed sources were taken into consideration, paying due attention to the effective height of chimneys; moving sources were also considered. For HC, only moving sources were considered because sufficient data were not obtained for fixed sources. The oxidant concentration distribution was determined. The results for nitrogen oxides were satisfactory.

52501 **APTIC NO. 74954**

Tanaka, Masayuki

GLOBAL AIR POLLUTION AND METEOROLOGICAL ENVIRONMENT. *(Gurobaru na taiki osen to kisho kankyo). Text in Japanese. Tohoku Gijutsu Dayori (Tokoku Technol. Bull.), no. 74:9-26, April 1975. 5 refs.*

A lecture given in March 1975 on the effects of atmospheric and marine pollution and artificially produced heat radiation on the meteorological environment on the earth is reproduced in edited form. Subjects covered include: past climatological changes; their causes, models for these changes, aerosol and solar radiation; carbon dioxide and climate changes, and effects of excess water vapor and nitrogen oxides (primarily by SST).

52502 **APTIC NO. 74847**

Tominaga, K.

PHOTOCHEMISTRY OF FLUOROCARBONS THE REACTION WITH OZONE IN THE STRATOSPHERE AND THE DESTRUCTION OF THE ENVIRONMENT. *(Fluorocarbon no kokagaku Seiso-ken no ozone tono hanno to kankyo hakai). Text in Japanese. Gendai Kagaku (Mod. Chem.), no. 50:20-23, May 1975. 3 refs.*

About 1 million tons of difluorodichloromethane and trichlorofluoromethane are being produced annually. Besides these, various fluorocarbons are also produced and consumed in coolants and aerosol sprays. All of the fluorocarbons are chemically stable. They diffuse slowly upwards and reach the stratosphere where they are decomposed by ultraviolet radiation and react with ozone. Several million tons of fluorocarbons have accumulated thus far. Photochemical decomposition is believed to be the only mechanism by which fluorocarbons are decomposed. The decomposition of fluorocarbons in the stratosphere results in two to three atoms of chlorine being liberated from one molecule of fluorocarbon. These Cl atoms react with ozone and liberate oxygen. A Cl atom reacts with O_3 to give chloroxy radical and O_2. The ClO reacts with atomic oxygen and gives O_2 and Cl. Thus a chain mechanism is completed. Although some Cl atoms are lost by the reaction with, for example, methane, this reaction is very slow. Therefore, the chain reaction continues for a considerably long time, decomposing a number of ozone molecules. It is estimated that a 5% decrease in the O_3 concentration in the stratosphere results in a 10% increase in thee ultraviolet radiation reaching the earth.

52503 **APTIC NO. 74844**

Tsuchiya, K.

A MINUTE CONSITUENT OF THE ATMOSPHERE, OZONE. *(Taiki chu no kisho kitai, ozone). Text in Japanese. Kagaku no Jikken (Sci. Through Exp), 26(5):374-376, March 1975.*

The ozone distribution in thee upper atmosphere of Japan, absorption characteristics of ozone, the relation between supersonic aircraft and ozone, the average zone distribution in the world, and the results of ozone model experiments are discussed. The partial pressure of ozone over Japan is about 20 times 10 to the 20 km and then rises again. At 20 km, it is 140 times 10 to the -6 millibar, and at 45 km it is 10 times 10 to the m -6 millibar. Absorption by ozone is strongest in the Hartley band which is around 0.260 micron. The flight of supersonic planes in the stratosphere decreases the conventration of zone in the upper sky, resulting in the passage of more ultraviolet rays down to the surface of the earth. The increase in ultraviolet rays can cause various ecological changes in animals and plants. The flight of 300 supersonic planes will exhaust 2 times 10 to the 7 nitrogen oxide molecules sq cm/sec. This Nox emissions will result in a decrease of about 1% ozone in the upper sky throughout the world. An ozone decrease of 2.5% is calcualted to increase the intensity of ultraviolet radiation on the earth by about 10%.

52504 **APTIC NO. 74940**

Tuomi, Tapio J.

THE EFFECT OF RELATIVE HUMIDITY ON LIDAR BACKSCATTER AND EXTINCTION BY THE ATMOSPHERIC AEROSOL. *Beitr. Physik Atmosphaere, 48(2):159-167, 1975. 12 refs.*

According to the theory of Haenel and others, relative humidity affects both the particle size and refractive index of ambient aerosols. This theory was used to compute the light backscattering and extinction coefficients of the Junge- distributed aerosol as functions of relative humidity. The humidity dependence of backscatter varied considerably with the size distribution, a fact that was particularly experienced in lidar measurements. This variation was very small for extinction.

52505 **APTIC NO. 76716**

Williams, Allen L.

RAIN SCAVENGING OF RADIOACTIVE PARTICLES. *California Univ., Livermore, Lawrence Livermore Lab., Energy Research and Development Contract W-7405-Eng-48, Rept. TID-4500, UC-11, 9p., Feb. 28, 1975. 6 refs.*

NTIS: UCRL-51765

A theoretical analysis of the rainout of airborne radioactive particles from a nuclear detonation is presented, with emphasis on microphysical removal processes. The scavenging process for particles with a radius greater than 1 micron is nucleation; for particles with a radius less than 1 micron it is attachment by Brownian and turbulent diffusion of the particles to droplets, first in a detonation-induced water cloud of 1000 droplets/cu cm for 15 min and later in a natural cloud of 300 droplets/cu cm for 15 min. The particles are distributed log-normally with a geometric mean radius ranging from 0.01-0.5 micron and a geometric standard deviation ranging from 1.5 to 2.5. The radioactivity is distributed either according to particle mass or particle surface area. An examination of various particle size and radioactivity distributions indicates that from 27-99% of the radioactivity is attached to cloud droplets and subject to rapid removal by rain. (Author conclusions modified)

52506 **APTIC NO. 74930**

Yokoyama, N.

AIR POLLUTION FORECASTING BY COMPUTER IN NEW INDUSTRIAL CITIES. *(Konputa ni yoru shin sangyo toshi no taiki osen no shorai yosobu to sokuji yosoku ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(2): 47-53, Feb. 1975.*

A wind tunnel experiment used for diffusion simulation at constant wind direction is described. This method cannot be applied when there are different wind directions and wind velocities, nor can it be applied when there is LID caused by an inversion layer. This wind tunnel model is effective for diffusion when there is complex air flow caused by downwash or land shape. An air pollution control system (APCS) method was used for the numercal calculation of the diffusion concentration of smoke on a complicated land shape. Calculations of ground concentration and horizontal diffusion width by the APCS method were in good agreement with those obtained by the wind tunnel experiment. The APCS diffusion model uses constant plume type and semi-constant puff type for the calculation sulfur dioxide concentations. The puff type is used at a wind velocity of 1 m/sec or less.

52507 **APTIC NO. 74552**

Yoshida, Katsumi

TECHNICAL CONSIDERATION OF THE REGULATION OF TOTAL EMISSION. *(Soryo kisei no gijutsu teki kosatsu). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 12(8):31-35, April 1975.*

A fundamental technique for the air pollution simulation is discussed in terms of over-all emission control. Japan's over-all emission law requires the practice of atmospheric diffusion simulation from which the emission rate at an individual place can be determined. The calculation of hour-averaged pollutant concentrations at ground level is more desirable; however, it lacks in accuracy. Calculations of concentrations for longer periods, i.e., seasonal concentrations are expected to agree better with observed levels. Most environmental standards are expressed in average concentrations for 1 hr or 24 hr, and the conversion of these standards to longer periods is essential in the simulation technique. The use of diffusion equations for simulation are defined as follows: the Moses-Carson equation and CONCAWE equation are used for large and small emission sources, respectively under wind conditions; the Briggs equation is used for both sources under no-wind conditions. The background term in these equations is the background concentration of the natural environment and includes measurement errors introduced by different measurement methods for the same pollutant. Diffusion parameters in the equations are arrived at empirically so that the simulated results agree with observed results. The simulation results must meet the following conditions: the slope of the regression line must be within 0.8 to 1.2, the correlation coefficient must be more than 0.71, and the simulated pattern of the concentration distribution must agree with the observed pattern.

52508 **APTIC NO. 74759**

Yoshino, Kenji and Shokichi Mita

THE COMPOSITION OF AEROSOLS IN THE ATMOSPHERE AND THE OPTICAL CHARACTERISTICS OF THE AEROSOL. *(Taiki-chu no earozoru no bushitsu kosei to sono kogaku teki tokusei ni tsuite). Text in Japanese. Preprint, Japan Society for General Research, Tokyo, Environmental Science Div., p. 71-72, 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Suspended particulates are classified into three groups, namely, hygroscopic, nonhygroscopic, and mixed particulates. The last group consists of insoluble particulates surrounded by hygroscopic substances. As the optical properties of these particulates are important, the Mie scattering characteristics and their dependence on humidity were examined. The change in particle diameter with humidity was also studied for sulfuric acid particles. The albedo of aerosols consisting of sulfuric acid, quartz, and carbon was calculated as a function of the carbon content. The effect of aerosols on the earth's temperature was calculated, assuming that the albedo of the earth is 0.15, the height of the uniform aerosol layer is 1.5 km, the number of particulates in 1 cu cm is 500, and that the aerosol particles consist of carbon, sulfuric acid, and quartz. The calculations showed that the presence of aerosols increases the temperature of the earth's surface when the humidity is low and decreases the earth's temperature when the humidity is high.

52509 **APTIC NO. 74830**

Conference for Air Pollution Control (Japan), Keiyo Region

REPORTS OF THE FORECASTING RESULTS ON AIR POLLUTION AT KEIYO REGION. *(Keiyo chiku taiki osen yosoku kekka hokokusho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(6):573-595, June 1975.*

The status of air pollution due to sulfur oxides in the Keiyo region is discussed with descriptions of existing industries and future industrial location planning, data of SOx concentration measured since 1971, and meteorological conditions. Based on SOx concentration measured from 1970 to 1972 and analyzed in relation to the meteorological conditions, a forecasting model was developed, and the parameters were corrected so that the actual pollution pattern could be reproduced. Using the model, pollution forecasting for 1977 was made. The forecasted value was evaluated in reference to the P-C curve corresponding to the environmental standard. The analysis method of meteorological conditions, wind tunnel diffusion tests, calculation method by diffusion equations, compound forecasting method, comparison of forecasted values with environmental standard, preparation of P-C curve, and comparison of forecasted value with P-C curve are described with data. Based on the forecasted values exceeding environmental standards, pollution control guidelines for industries were formulated.

52510 **APTIC NO. 74842**

Kanto Regional Headquarters for Promoting Countermeasures to Public Nuisance (Japan), Section of Air Pollution

RELATION BETWEEN PLANT DAMAGE DUE TO PHOTOCHEMICAL SMOG AND METEOROLOGICAL CONDITIONS. *(Shokubutsu higai to Kisho joken). Text in Japanese. In: Report on the Influences of Photochemical Smog on Plants, 1974. p. 52-80, March 1975.*

The plant damage due to oxidants was investigated just after the end of Tsuyu period and also after a heavy rainfall due to a typhoon during 1974. Several days before the investigations, the temperature was high with plenty of sunshine. According to an analysis of ground wind structure on July 22 and 28, and August 21 and 22, the wind type on July 28 was a stagnant front and those on other days were progressing fronts. A sea breeze was predominant on July 27 and 28 from Sagami and

Tokyo bays, on August 21 from the Pacific ocean, and on August 22 from three directions. The locality of plant damage and the occurrence of oxidant pollution appeared to closely correlate with the ground wind structure.

1974

52511 **APTIC NO. 76673**

Baudoin, P., P. C. Blokker, B. E. Davis, P. Genin, S. L. Hobkinson, D. H. Labdon, R. Sarteur, and P. van der Wee

THE DISPERSION FROM A COMPLEX OF STACKS: CALCULATIONS WITH DATA FROM SEVERAL INDUSTRIAL COMPLEXES IN THE VICINITY OF INGOLSTADT (WESTERN GERMANY). *Stichting CONCAWE, The Hague (Netherlands), Air Pollution Special Task Force 1: Dispersion from a Complex of Stacks, Rept. 3/74, 55p., July 1974. 10 refs.*

The best method for calculating the dispersion of sulfur dioxide from stacks in an industrial complex located in the vicinity of Ingolstadt, West Germany was investigated. The observed concentrations were generally low. During several days when high concentrations occurred, these were widespread throughout the area, i.e., upwind and downwind of the industrial complex: therefore, the levels were almost certainly not related to the emissions being considered. Thus the Ingolstadt data were unsuitable for the purpose intended, and no conclusions were drawn regarding the best method for calculating stack gas dispersion. Computer calculations and statistical analyses of the data obtained are presented.

52512 **APTIC NO. 74729**

Giebel, J.

METEOROLOGY AND AIR POLLUTION. *(Meteorologie und Luftverschmutzung). Text in German. Therapiewoche, 24(43):5000, 5003-5004, 5007, Oct. 1974. 12 refs.*

Relationships between air pollution and meteorological conditions are discussed. Sulfur dioxide concentrations are highest during the winter due to emissions from domestic heating, while they are lowest in the summer partly as a result of improved turbulence and dispersion conditions. Domestic heating and other low emission sources usually make a greater contribution to local pollution levels than do high emission sources. The height of the emission source plays no role in the overall pollution level. While the pollutant concentrations tend to decline with increasing wind speed, that may also increase due to a reduction in the elevation of flue gas plumes. Pollutants accumulate in the lower layers of the atmosphere most readily under the following conditions: when the wind speed, as measured at ground level, is not greater than 3 m/sec, when that measured at 5000 m altitude is not greater than 50 km/hr, in the presence of low inversion with a minimum temperature gradient of 2 C in the lower 200 meter-layer, and in the absence of precipitation. Precipitation is the most efficient factor in the elimination of air pollutants.

52513 **APTIC NO. 74606**

Goysa, N. I., T. V. Zheleznyakova, and V. A. Snoshin

EFFECT OF HUMIDITY AND AEROSOL CONCENTRATION ON ATMOSPHERIC TRANSPARENCY. *Tr. Nauchn.-Issled. Inst. Gidrometeorol. Kiev, no. 77:94-101 13 refs. Translated from Russian. Leo Kanner Assoc., 14p., May 1, 1974.*

NTIS, DDC: ADA001499

Measurements of direct solar radiation and radiosonde data for the vertical distribution of the specific humidity from 1954-1961 were used to obtain quantitative characteristics of the effects of water vapor and aerosols on atmospheric transparency. One thousand actinometric observations and data from 690 radiosonde ascents were used in the study.

52514 **APTIC NO. 74513**

Kubo, Tomohiro

BASIC INVESTIGATIONS FOR AIR POLLUTION FORECASTING. *(Taiki osen yoho no kiso chosa). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15:52, 1974.*

Environmental pollution levels at times of emergency, as stated in the air pollution prevention law, were divided according to three degrees, and the relationship between air pollution high pressure conditions at Osaka, Japan was studied. The majority of the highest pollution episodes (A degree) occurred when high pressure existed between 120-140 deg east longitude and 30-40 deg north latitude. Pollution was predicted based on whether or not a ground inversion layer existed. However, it was difficult to distinguish the degree of pollution from the way the inversion layer dissolved. Therefore, to predict air pollution from meteorological charts, the formation of inversion layers must be studied along with observations of clouds, sunlight, and wind conditions, all of which determine the dissolution of the inversion layer.

52515 **APTIC NO. 74883**

Kuronuma, H., K. Kudo, and Y. Omi

A THREE-DIMENSION TURBULENCE DIFFUSION MODEL FOR ESTIMATING AIR POLLUTION FROM EXHAUST GASES. *(Jidosha haiki gasu ni yoru taiki osen suitei no tameno sanjigen ranryu kakusan moderu ni tsuite). No. 2. Text in Japanese. Preprint, Japan Society of Civil Engineers., Tokyo, Vol. 4:272-273, 1974. (Presented at the Japan Society of Civil Engineers, Lecture Meeting, 29th, Tokyo, Japan, 1974.)*

The formulation of a turbulence diffusion equation of air diffusion is presented. Therefore, the turbulence diffusion equation, applying Taylor's turbulence theory, a turbulence diffusion coefficient is obtained. Atmospheric diffusion can be regarded as a combination of a vector (flow velocity) and a scalar (pollution concentration). The following principles were established: the field of flow and field of diffusion should correspond to the same physical expression, and in determining field of flow, a complete flow approximation should be utilized. There was no significant difference in the concentration of the vertical air flow in the model which was constructed, as determined by the height and proximity of the buildings to each other.

52516 **APTIC NO. 74933**

Mitsuse, I. and Y. Yamada

PURIFICATION OF CARBON MONOXIDE IN ATMOSPHERE BY SOILS (REPORT II). *(Tsuchi ni yoru taikichu issanka tanso no joka sayo ni tsuite (Report II). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, Vol. 4:274-275, 1974. (Presented, at the Japan Society of Civil Engineers, Lecture, Meeting, 29th, Tokyo, Japan, 1974.)*

In loosely-packed and scattered soil, the decrease in carbon monoxide is proportional to weight of soil. With tightly-packed soil, the decrease is proportional to the exposed surface. Therefore, CO purification by soil can be calculated by unit weight of loosely-packed soil, and per unit of surface area of the tightly packed soil. When soil is submerged in water, the volume of water affects the purification effect, i.e., the greater the depth, the less the decrease of CO. Water in which soil is mixed, or floating around, is capable of purifying CO. The same effect is produced when such water is filtered. Although the purification effect increases, when the same soil is used repeatedly for purification of CO, there is a limit, which depends on the type of soil. Natural soil releases carbon dioxide, the degree again depending upon the type of soil, but no clear correlation between the decrease of CO and the increase of CO2 was established.

52517 **APTIC NO. 74426**

Miyake, Yasuo

METEOROLOGICAL RESEARCH BY CHEMICAL METHODS. *(Kagakuteki shuho ni yoru kisho no kenkyu). Text in Japanese. Tenki (Weather), 21(10):491-495, Oct. 1974. 75 refs.*

Meteorological research using chemical methods is described. The problem of pollutants present in the atmosphere in infinitesimal quantities is discussed. Suflur oxides in the atmosphere over the Marunouchi area of Tokyo were measured as 0.005 ppm in 1937 to 1938. Parallel research of chemical substances in rainwater was conducted. The concentrations of sulfur oxides, ammonia, and chlorides and annual fluctuations were recorded. Theoretical calculations of the vertical and horizontal distributions of ozone were also conducted. Remarkable differences between the amount of the ultraviolet light measured in Marunouchi and in Koenji during 1952 were observed, suggesting that urban smog reduces the amount of ultraviolet radiation. Measurements of radioactive substances in rain and fall-out were also performed.

52518 **APTIC NO. 74490**

Sakai

SEA AND LAND BREEZE IN ONAHAMA AREA IN FUKUSHIMA PREFECTURE. *(Fukushima-ken Onahama chiku no kai rikufu ni tsuite). Text in Japanese. Tohoku Gijutsu-dayori (Tohoku Technol. Bull.), no. 72:8-9, Dec. 1974.*

The relationship between the air pollution concentration and the wind was studied around the Onahama area. During the day or at night when more than 90% of wind was from the sea, it was termed sea wind day (east-southeast to southwest); land wind was west-northwest to northeast. Although the pollution sources and emissions in this area were much smaller than in the Kanto area, similar levels were observed in Onahama when the sea wind affected the pollution transport. The concentration of sulfur dioxide became higher immediately after a changeover from a sea to land breeze and vice versa in the morning and at night, forming two peaks.

52519 **APTIC NO. 74560**

Sonobe, Y.

METEOROLOGICAL CHARACTERISTICS OF AND A TENTATIVE FORECASTING METHOD FOR PHOTOCHEMICAL OXIDANTS IN YOKKAICHI. *(Yokkaichishi no kokagaku okishidanto no kishogakuteki tokusei to yoho no shian). Text in Japanese. Kishocho Kenkyu Jiho (J. Meteorological Research (Tokyo)), 26(8):21-27, Aug. 1974. 6 refs.*

After determining the meteorological characteristics at Yokkaichi, an attempt was made to forecast photochemical smog. As is the case with sulfur dioxide, oxidant pollution in Yokkaichi was influenced by land and sea breezes, and pollution varies over a wide range. It became especially high with the emergence of temperature inversions. There was a strong correlation with thermal stability up to 1200-1500 m altitude. It was possible to forecast degree of pollution by each meteorological factor and by classes. Applying multiple regression to the meteorological factors, it was possible to estimate the degree of pollution quantitatively.

52520 **APTIC NO. 74424**

Tsuchiya, Iwao

SOME FEATURES OF THE URBAN ENVIRONMENT OF TOKYO BY REMOTE SENSING OF GROUND SURFACE TEMPERATURE. *Papers Meteorol. Geophys. (Tokyo), 25(3):147-158, Sept. 1974. 6 refs. (Presented at the International Symposium on the Remote Sensing of the Environment, 9th, 1974.) ABSTRACT*

Four observations of surface temperature of the urban area of Tokyo were made using several airborne remote sensing methods on bright sunny summer afternoons. The surface temperature of a river, with a large amount of water had the lowest temperature, natural or near-natural forests had the next lowest temperature, an urban area with many highways was hotter than a suburban area with greenery, and a main street with heavy traffic was the hottest. Many cases required a + or - 5-10 C correction of the airborne records on heated roads and buildings. A thermal complex corresponding to urban schools and residences was found, and wind tunnel experiments based on this data indicate thermal convective circulation under an inversion layer. Leaf temperature or layer roadside trees in the heated urban area were higher than ambient. Thermal maps of a residential area and of a densely populated urban area including several large green zones were analyzed. Lower surface temperatures were observed on the leeward side of large green zones and wide rivers. Urban air circulation becomes complex by compounded heated and cooled areas under the thermal inversion during sunny summer days, causing a complicated flow of polluted air which results in several densely polluted spots in the suburban areas.

52521 **APTIC NO. 74745**

Kanagawa Prefectural Government (Japan)

PRESENT STATUS OF AIR POLLUTION AND ITS COUNTERMEASURES. *(Taiki osen no genjo to taisaku). Text in Japanese. In: Environmental White Paper in 1974, p. 87-89, Dec. 1974.*

The characteristics of air pollution in Kanagawa Prefecture are described in terms of topographical characteristics (western mountainous region, central plain, eastern littoral area) and meteorological conditions (wind velocity, wind direction, pressure pattern, weather, atmospheric stability, temperature, humidity and visibility). Data on liquid and solid fuel consumption in Yokohama and Kawasaki during 1973 are compiled. The sulfur dioxide concentration was measured by the conductometric method at 43 locations (yearly average 0.014-0.045 ppm) and by the lead dioxide method at 65 locations (yearly average 0.014-0.038 ppm). The average sulfur oxides concentration in Kanagawa Prefecture (1971-1973), SOx concentration in Yokohama and Kawasaki cities (1967-1973), and regional average SOx concentration (1967-1973) compiled showed a generally decreasing trend. The nitric oxide and nitrogen dioxide concentrations measured during 1973 were 0.010-0.043 ppm (yearly average) for NO and 0.021-0.045 ppm (yearly average) for NO2.

1973

52522 **APTIC NO. 74306**

Glowiak, Bohdan and Bogumila Sokolowska-Cwynar

ESTIMATION OF THE DISPERSION OF SULFUR DIOXIDE EMITTED BY A COPPER MELTING PLANT. *(Obliczanie rozkladu stezenia dwutlenku siarki emitowanego przez hute miedzi). Text in Polish. Ochr. Koroz., 16(5):129-133, May 1973. 4 refs.*

A statistical method for determining the dispersion of sulfur dioxide from inudstrial stacks is presented. The concentration of gaseous pollutants emitted is determined by using a modified Sutton's equation. Sulfur dioxide diffusion in the vicinity of a copper plant is calculated under especially unfavorable meteorological conditions. Several pollution sources can be treated by employing graphical summation methods. The statistical method can be used for areas exposed to continuous or periodical emissions from one or more sources. The data required for calculations include: the coefficient of pollutant emission as related to unit production or emission value; the diameter and height of the emitter; the location of the emitter; the intensity of gas flow from the source; the temperature of the gases; the actual temperature of the gases; wind velocity and direction; and the mean daily temperature.

Reproduced from best available copy.

52523 **APTIC NO. 76679**

Hesek, Ferdinand and Dusan Zavodsky

USE OF COMPUTERS IN SOLUTION OF AIR POLLUTION PROBLEMS. *(Vyuzitie samocinnych pocitacich strojov pri rieseni problematiky znecistenia ovzdusia). Text in Slovak. Ochrana Ovzdusi, 5(3):37-40, March 1973. 6 refs.*

An atmospheric diffusion model and a computer program are used to determine the distribution of sulfur dioxide at specified altitudes emitted by a set of point and distributed sources located in bounded area. In addition to parameters of pollution sources, the model requires data on wind and on vertical temperature stratification of the atmosphere. A gaussian distribution of the gaseous pollutants is assumed in any vertical or horizontal plane of the atmosphere. The computer program is used to predict the total annual amount of SO2 emitted in the Bratislava region in 1970. The input data are obtained from parameters of 14 discrete emission sources (more than 5 g/sec of SO2) and 13 extended sources, having diameters of 1.5 km, and for three ranges of wind velocity. The computer algorithm is outlined in detail. A comparison of computer results with data obtained from 11 control stations shows only three significant discrepancies.

52524 **APTIC NO. 76703**

Hulst, H. C. van de

MULTIPLE SCATTERING CLOUD LAYERS: SOME RESULTS. *Dept. of Transportation, Washington, D. C., Climatic Impact Assessment Program, National Aeronautics and Space Administration, Washington, D. C., T.R.W. Systems, Inc., McLean, Va., Army Research Office, and California Univ., Los Angeles, Dept. of Meteorology, UCLA Int. Conf. Proc. Radiat. Remote Probing Atmos., Los Angeles, Calif., 1973, p. 162-195. 9 refs. (Aug. 28-30.)*

NTIS: N 75 11554

Models and sample computations for multiple scattering in cloud layers are discussed. Numerical results derived from isotropic scattering are reviewed, including the cases of very thin and very thick slabs. The method of successive orders and expanding the Milne operator systematically in eigenfunctions are discussed in relation to very thick and very thin slabs and isotropic scattering. Other topics covered include: representation of the phase function, similarity checks, polarization, emission by internal sources, and path length distributions.

52525 **APTIC NO. 74445**

Kubo, Tomohiro

THE RELATIONSHIP BETWEEN SEA BREEZE FRONT AND OXIDANT CONCENTRATIONS. *(Kaifu zensen to Ox nodo no kankei). Text in Japanese. Kisho Gijutsu Noto (Meteorol. Study Note), 14(1-2):98-102, Dec. 1973. 4 refs.*

The oxidant concentration data obtained at several measuring stations in Osaka during 1971, 1972, and 1973 were analyzed in relation to the sea breeze front. The meteorological data including the sea breeze front on days of high oxidant concentration are given with diagrams. The concentration showed a definite increasing trend in the three years studied. In 1971 and 1972, the phenomena of high oxidant concentration along the sea breeze front or in the area of stagnant sea breeze (such as the case in the Kanto area) were not observed. In the Osaka area, no definite relationship was found between the distribution of oxidant concentration and the behavior of the sea breeze front. In 1973, a case of high oxidant concentration carried by the sea breeze was observed. However, the data are insufficient to claim a change in the mechanism of oxidant pollution in the Osaka area, since various types of pollution mechanisms are involved.

52526 **APTIC NO. 74355**

Ohara, A.

STUDIES ON PREVENTION OF PLANT DAMAGE DUE TO AIR POLLUTION. PART 1. INFLUENCE OF AIR POLLUTION ON TREES. *(Jumoku no kogai-boshi shiken 1. Taikiosen no jumoku ni oyobosu eikyo). Text in Japanese. Fukui-ken Ringyo Shikenjo Hokoku (Annu. Rep. Fukui Prefect. For. Exp. Stn), no. 12:28, 1973.*

The range of the influence of automobile dust on roadside trees near road-crossings was surveyed by determining the amount of dust that adhered to each of 20 leaves per Magnolia kobusu planted along the sidewalk between two crossings. The distance between the crossing was more than 500 m. Twenty leaves from one tree were washed in 100 ml of pure water with a writing brush, and the dust was dried and weighed. The amount of dust on leaves gradually increased from a crossing stop-line point to just in front of the crossing. The amounts ranged from 6.77 to 37.47 mg/100 sq cm of leaf area. The motor traffic between 8 am and 6 pm on August 1, 1973 was 8063 cars.

52527 **APTIC NO. 74523**

Okura, Katsuaki, Susumu Abe, and Masao Morii

ANALYSIS OF AIR POLLUTION AND SEA-LAND BREEZE BY PILOTBALLOON STUDIES. *(Taiki osenmen kara mita paibaru kaiseki to kairikufu no kaiseki). Text in Japanese. Kisho Gijutsu Noto (Meteorol. Study Note), 14(1-2):65-71, Dec. 1973.*

In Mizushima littoral industrial area, the sulfur dioxide emission quantity was 6400 N cu m/h during the period from May to August 1972 and 7800 N cu m/h in other months. To obtain necessary information for pollution forecasting, the wind direction and velocity at altitudes 0-1000 m were measured using a pilotballoon during 1972. The relationship between air pollution and pilotballoon wake diagram or sea-land breeze were analyzed. The pilotballoon wake diagrams were classified into 23 patterns, and diurnal changes in pattern were analyzed. The frequency of SO2 concentration higher than 0.15 ppm tended to be higher in the case of wake patterns of the first quadrant. With E wind on ground level and S wind in the upper layer (generally before and after rain), the SO2 concentration at the east side of the industrial conglomerate tended to be higher. The sea-land breeze is more readily developed from spring to summer, and the SO2 concentration is generally increased at such time. The probability of high SO2 concentration incidence (higher than 0.15 ppm) during sea-land breeze development was 66%. The maximum concentration was shown zero to three hours after the start of sea breeze, which indicated the blowing back phenomenon of pollutants accumulated over the ocean by land breeze during the night.

52528 **APTIC NO. 74531**

Ota, Hisao, Tetsushi Saito, Daijiro Kita, Masao Shishikura, Kikuo Izumi, and Yoshiko Taniguichi

SEA-LAND BREEZE FRONT AND OXIDANT CONCENTRATION. *(Kairikufu zensen to okishidanto nodo). Text in Japanese. Kishio Gijutsu Noto (Meteorol. Study Note), 14(1-2):86-97, Dec. 1973.*

For a study of the relationship between sea-land breeze front and oxidant concentration in Chiba Prefecture Ichihara city on Boso peninsula with the Keiyo industrial area along Tokyo Bay on the west side and the Pacific Ocean on the east side was selected. The data compiled on two high oxidant concentration days, Aug. 30, 1972 with west wind and June 10, 1972 with southeast wind, were analyzed. The meteorological characteristics of high oxidant concentration days are as follows: the high oxidant concentration occurs on a clear day but with low visibility and small pressure gradient. As for the insulation, the infrared intensity is higher than on usual days and the visible and ultraviolet intensities are decreased. The high oxidant concentration is closely related to the behavior of the sea-land breeze front, and the closer to the front the higher the oxidant concentration. The weak wind at an altitude of 500 m is an important factor, and the altitude of sea breeze is markedly lowered at the time of high oxidant concentration. The data on pollutant concentration in upper wind layer are insufficient, and the convergence effect on pollutant by the line of discontinuity is not clear.

52529 **APTIC NO. 74530**

Ota, Seizo

SEA-LAND BREEZE AND AIR POLLUTION IN OTAKE. *(Otake-shi ni okeru kairikufu to taiki osen ni tsuite). Text in Japanese. Kisho Gijutsu Noto (Meteorol. Study Note), 14(1-2):78-85, Dec. 1973.*

The relationship between the sulfur dioxide concentration and the sea-land breeze in littoral industrial Otake city was investigated based on data for 1972. The SO2 concentration distribution of annual average value for 1972 and the wind rose showing diurnal changes in sea-land breeze based on the one year average are analyzed. The average SO2 concentration, the frequency of E + ESE + SE wind directions (sea breeze) and the occurrence rate of high SO2 concentration were calculated. The correlations between SO2 concentration higher than 0.1 ppm and the sea breeze are 0.6-0.8 in area some distance away from the pollutant source and 0.19 in the immediate area of pollutant source, indicating a definite correlation between SO2 concentration and sea-land breeze in areas away from the pollutant source.

52530 **APTIC NO. 76684**

Papez, Antonin

THE EFFECT OF AIR POLLUTION ON THE DURATION OF INSOLATION AT KARLOV IN PRAGUE. *(Pokles slunecniho svitu vlivem znecisteni ovzdusi v Praze na Karlove). Text in Czech. Meteorologicke Zpravy, 26(5):136-140, May 1973. 4 refs.*

Insolation data obtained during the years 1923-1970 from observatories at Karlov in Prague are analyzed to assess the effect of atmospheric pollution in Prague on the duration of insolation. The data are analyzed by a method of sliding weighted averages. The linear trend of total yearly amounts of insolation at Karlov shows a rate of decrease which is twice that observed at Ruzyne and Semcice. Analysis of the period 1946-1970 indicates that a rapid decrease in insolation at Karlov began approximately in 1950. Analysis of monthly total amounts of insolation and of their linear trends for the period 1946-1970 indicates that the greatest decrease in insolation at Karlov occurs during the warm season of the year. Temperature inversions present during the warm season and the stability of the surface layer of air during the cold season appear to be responsible for this behavior. The Karlov data were then processed in such a way as to obtain the hourly average total insolation for the periods 4-8 am and 4-8 pm in the months April-September for 5-year blocks between 1936 and 1970. The fastest decreases in insolation occurred during the morning and evening hours. During the warm season, when a greater movement of air disperses the pollutants over a large area because of convection, the Karlov region becomes polluted by more remote and newly installed sources. When the convection settles during sunset and at night, it creates favorable conditions for sufface temperature inversion. The pollutants concentrate in this inversion and become most evident during sunrise, decreasing substantially the duration of insolation.

52531 **APTIC NO. 74604**

Stensland, Gary J.

NUMERICAL SIMULATION OF THE WASHOUT OF HYGROSCOPIC PARTICLES IN THE ATMOSPHERE (TECHNICAL REPORT). *Pennsylvania State Univ., Univ. Park, Dept. of Meteorology, Office of Air Programs Grant T900011, Select Group in Air Pollution Meteorology Grant R800397, Center for Air Environment Studies Rept. 327-73, 158p., Aug. 1973. 88 refs.*

A numerical model was constructed to simulate the washout of aerosols. Washout coefficients were calculated as a function of the rainfall intensity, the relative humidity, and the nature and size of the particles. The washout mechanism was highly dependent on the relative humidity (especially in relation to its effect on the size distribution of hygroscopic particles), on the rainfall intensity (especially for small rainfalls), and on the chemical nature of the particles. With the assumption of no particle replenishment, only 20% of the initial aerosol mass remained in the subcloud layer after 4 mm of rainfall for the best washout conditions, and after 15 mm for the worst conditions. After these rainfalls, changes in rainfall intensity and relative humidity had little significance for washout since little aerosol mass remained to be scavenged. The model predictions of average rainwater concentration variations due to meteorological parameter changes are consistent with values actually measured. (Author abstract modified)

52532 **APTIC NO. 74510**

Ueguchi, N., H. Okamoto, and Y. Ide

THE CIP DIFFUSION MODEL FOR AIR POLLUTION PREVENTION. *(Taiki osen boshi no tameno CIP kakusan moderu no kaihatsu kenkyu). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 10(5):623-629, 1973 18 refs.*

A Calm-Inversion Pollution (CIP) dissusion model that was developed to predict the pollution level during a calm period in which a capping inversion layer exists in the atmosphere is described. The model assumes that the diffusion process is more effective than the transfer process for pollutant removal from the air. The model can be used for an area having several stationary emission sources; the contribution of each emission source is added. The model predicts that the ground level concentration is inversely proportional to chimney height and inversion layer height. No high concentration at the ground level is expected unless a capping inversion layer persists for a long period. The ground level concentration increases with the extended presence of the layer. The contribution of emission sources to the observed ground level concentration occurs faster for lower chimneys than for high chimneys.

52533 **APTIC NO. 74880**

Ueguchi, Nobuhiro, Hirotaka Okamoto, and Mutsuo Kuragasaki

THE VARIATION OF GAS ELEVATION WITH THE SECTIONAL CONFIGURATIONS OF STACK EXIT NOZZLES. *(Entotsu chobu keijo no ryuryokuteki mondai). Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 10(5):630-635, Sept. 1973.*

Wind tunnel studies were made concerning variations in heights of gas elevation due to differences in the sectional configurations of stack exit nozzles. To promote diffusion of stack gases high stacks are desirable, but in addition, momentum and temperature buoyancy of the gases themselves must be utilized to increase the height of gas elevation. Ammonia gas was used as a tracer to observe stack gas behavior in the wind tunnel. Sectional configurations of stack exit nozzles were of two general types: aggregate; wherein the nozzle shapes fit together like a jigsaw puzzle, so that the general external shape of the nozzle collection is circular; and collective; consisting of a collection of circular nozzles, with varying general external shapes (ellipse, equillateral triangle, square) dependent on the number of nozzles. The aggregate-type configuration resulted in momentum of 95, when the momentum of elevation for a stack consisting of one circular nozzle was taken to be 100. The moment for the collective-type configuration was 85% of the aggregate-type. The effectiveness of the stack increases when the base of the stack is of irregular shape, while the upper portion is circular. When there is too much separation (more than 2.5% of the inside diameter at the exit) among the stacks comprising the aggregate-type configuration, effectiveness decreases. An increase in downwash occurs when the outside diameter of the aggregate stack increases. To prevent this effect, the height of the stack should be about 4 times its diameter.

1972

52534 **APTIC NO. 76696**

Filippov, V. L., S. O. Mirumyants, and L. M. Artem yeva

SOME RESULTS OF A STUDY OF THE SPECTRAL ATTENUATION OF IRRADIATION BY THE SURFACE LAYER OF THE ATMOSPHERE. *Rass. Sveta Zemn. Atmos., Nauka, Alma-Ata, 1972:170-174, 1972. 9 refs. Translated from Russian. Leo Kanner Associates, Redwood City, Calif., 7p., June 28, 1974.*

The spectral attenuation of infrared radiation by the surface layer of the atmosphere was investigated. Transparency spectra were recorded continuously for haze over periods of 4-5 min. Although variations in the spectral behavior of infrared attenuation coefficients for haze were observed, Mie theory was used to accurately predict the coefficients. It also appeared possible to predict where uniform optical properties for aerosols can be expected.

52535 **APTIC NO. 74609**

Martens, Christopher Sargent

ATMOSPHERIC CHEMISTRY OF COASTAL AEROSOLS, CLOUD DROPLETS AND RAIN. *Florida State Univ., Tallahassee, Dept. of Oceanography, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 72-27, 925, 1972, 159p. 48 refs.*

Chemical changes occurring during the transformation of aerosols to cloud droplets and rain were observed in orographic clouds on the eastern end of Puerto Rico and in the San Francisco Bay area. Comparisons of elemental ratios in particles and rain and of elemental particle size distributions in and out of the clouds demonstrated scavenging efficiencies greater than 100% for iodine, bromine, and chlorine relative to sodium and less than 25% for aluminum, manganese, and vanadium relative to sodium. Particle growth due to fog droplet formation in San Francisco was less than in Puerto Rico. Vanadium sampled in the San Francisco Bay area originated from soil and pollution sources, while in Puerto Rico they were associated with an aluminum depleted soil source. Total chlorine losses to the gaseous phase averaged 16% in Puerto Rico, and 43% in the Bay area samples. This wide range in losses was probably due to lower humidities in the Bay area which may have resulted in volatization of gaseous chlorine during the liquid to solid phase transition in sea salts.

52536 **APTIC NO. 76688**

Pankrat yeva, T. B.

AIR POLLUTION AS A RESULT OF THE APPLICATION OF THE INSECTICIDE ANTHIO BY TRACTORS AND AIRCRAFT TO THE COTTONFIELDS OF UZBEKISTAN. *In: Sanitary and Hygienic Problems under the Conditions of the Hot Climate of Uzbekistan. (Voprosy Sanitarii i Gigiyeny v Usloviyakh Zharkogo Klimata Uzbekistana. Tashkent (UZSSR), Meditzina Publishing House, 1972, p. 93-95. Translated from Russian by Roger T. Crozier, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, Foreign Technology Div., 7p., Nov. 18, 1974.*

NTIS, DDC: AD 002803

Air pollution resulting from the application of an organic phosphorus insecticide known as anthio was investigated in cotton fields located in Uzbekistan. A total of 203 samples were taken; 121 of them were from areas where the pesticide was applied by aircraft, and 82 were from areas where tractors were used to apply the pesticide. The highest concentration (0.254 mg/cu m) of the pesticide was detected on the day of application at a distance of 500 m from the point of application. The airborne concentration decreased by half on the second day, and within a week the concentration was decreased by 28 times. Anthio was present in the atmosphere until the fifth day at a distance of 700 m. Anthio was not detected at a distance of 1500 m. There was considerably less air pollution when the pesticide was applied by tractors; at a distance of 500 m from the point of application, the concentration of anthio was 0.092 mg/cu m.

1955

52537 **APTIC NO. 76692**

Moriguchi, M.

ATMOSPHERIC SO2 IN TOKYO DISTRICT - ATMOSPHERIC POLLUTION (II). *Preprint, Meteorological Research Inst. (Japan), p. 144-149, 1955. 2 refs.*

Relationships between sulfur dioxide concentration and wind speed and direction, atmospheric stability, and visibility were examined for the Tokyo area from January 18-24, 1955. Estimated SO2 concentrations showed higher correlations when the measuring stations were located adjacent to each other. The effect of wind speed on SO2 concentration was significant at three out of seven monitoring stations, with SO2 levels decreasing with increasing wind speed. Data on the relationship between wind direction and SO2 concentration were inclusive. Correlation coefficients for atmospheric stability and SO2 concentration were significant only during the evening hours. A significant correlation at the 1% level existed between SO2 concentration and visibility, with the latter being inversely proportional to the former.

BASIC SCIENCE AND TECHNOLOGY

1975

52538 **APTIC NO. 74313**

Ando, Wataru, Setsuko Nakaido, Toshihiko Migita, Shin Suzuki, and Nobutoshi Horiuchi

PHOTOCHEMICAL REACTION OF SULFUR DIOXIDE AND ORGANIC COMPOUNDS (VI): DETECTION OF INTERMEDIATES IN THE PHOTOCHEMICAL REACTIONS OF SULFUR DIOXIDE WITH ORGANIC COMPOUNDS IN A BLANKET OF OXYGEN. *(Aryusan gasu to yukikagobutsu tono kokagaku hanno, VI, sanso funiki ni okeru aryusan gasu to orefin tono kokagaku hanno ni okeru hanno chukantai no kenshutsu). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 781, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1033.)*

Sulfur dioxide, oxygen and butene-1 at different mole ratios were reacted in a 400-milliliter reactor at 20-25 C under irradiation with a high pressure 450-watt mercury lamp. The reaction products were extracted with carbon tetrachloride, and the concentrated products were analyzed by gas chromatography and mass spectroscopy (1 m by 3 mm 3% SE-30 column at 120 C). Three major products were separated and showed mass/energy values of 56, 64, 88 and 152; 56, 88, 120, and 176; and 56, 88, 117, 146, and 192, respectively. The infrared spectrum of each product showed strong absorption by sulfone or sulfene stretching. The first product, at the highest yield regardless of the mole ratios, appeared to be a five or 6-membered ring 1:1:1 adduct of the three reactants. The second product, whose yield increased as SO2 decreased, appeared to be a five or 6-membered ring 2:1 adduct of butene-1 and SO2. The third product was an adduct of possibly two molecules of butene-1, one molecule of SO2 and one oxygen atom. Sulfur dioxide, cis-2-butene, and oxygen gave only one product which was structurally similar to the first product in the above case.

52539 **APTIC NO. 74591**

Boehm, Jaroslav

THE CHARGING OF POLYDISPERSE DUST SYSTEMS IN A PLATE-TYPE ELECTROSTATIC PRECIPITATOR SUPPLIED BY RECTIFIED VOLTAGE. *(Die Aufladung von polydispersen Staubsystemen in einem, durch gleichgerichtete Spannung gespeisten, Plattenelektrofilter). Text in German. Staub, Reinhaltung Luft, 35(6):220-226, 1975. 1 ref.*

The problematics of the electrical charging of solitary particles and of a complex polydisperse dust-system in fields which are non-homogeneous and which change periodically with time under the simultaneous action of both charging mechanisms (i.e., field strength and particle-charging) is discussed. The damping effect of the aerodispersed dust on the flow of ions, with respec. to complex charging conditions, is formulated. These formulations show that the charging of each particle, regardless of size, is determined by the two simultaneous charging mechanisms. The temperal charging pattern in a periodically changing field in stepwise, where the size of the steps decreases with decreasing time. The configuration of the electron system may alter the charging conditions considerably. Current damping and ion consumption increase with increasing concentration and dispersion of dust. Current damping and ion consumption decrease with increasing dust charge.

52540 **APTIC NO. 74858**

Fukui, Naoshizu, Osamu Kawaguchi, Gen Fujimoto, Makoto Naganaga, and Go Sato

DEVELOPMENT OF SPIRAL INJECTION VALVES OF THE TWO-FLUID REFLUX TYPE. *(2-Ryutai kanryushiki uzumaki funshaben no kaihatsu). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 71-80, 1975. 3 refs. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

A pulverizing valve was developed for the preparation of minute liquid particles, especially for use in gas turbines for smaller automobiles. Simplicity, low cost of production, and quick response to the change in the consumption of fuels were taken into consideration. Maximum pressure used for the spraying of fuels was 5 kg/sq cm g. However, the pressure exerted on the valve itself was 3 kg/sq cm g at most because of the pressure loss in the filter and the lead pipes. The flow rate of the fuel was 20 cc/sec at the most. It was possible to continuously change the fuel flow between 0 and 20 cc/sec. The spraying angle was 90-120 deg. To promote the formation of fine liquid particles, a two-fluid injection system was adopted. The liquid fuel was pulverized by collision with the air stream. The effect of the distance between the tip of the nozzle and the point of collision on the pulverizing of the liquid was studied. The size of the particles was measured as a function of various parameters using the Sauta average particle diameter method. The widening of the spray was also studied with the aid of photographs.

52541 **APTIC NO. 74939**

Gutowski, Witold

A NEW METHOD FOR THE MEASUREMENT OF THE WETTING ANGLE FOR DUSTS. *(Eine neue Methode zur Messung des Benetzungswinkels von Staeuben). Text in German. Staub, Reinhaltung Luft, 35(7):266-271, 1975. 5 refs.*

A new method of measuring the wetting angle of dusts is described. The method is based on the capillary action of the dust layer, and on the theoretical calculations. It is an absolute method which permits the prediction of the wetting angle of dusts and powders in the entire range of wettability, i.e., in the range of wetting angles from 0 to 180 deg. A description of the apparatus, the measurement principles and the error of the method are presented. Examples of angle measurement by water of the wettable and unwettable dusts are also given. The influence of dust heterogeneity, with respect to wettability, on the measurement was analyzed.

52542 **APTIC NO. 74870**

Iwasaka, Yasunobu

OXIDATION OF SO2 IN THE OZONE LAYER. IV. *(Ozon-so ni okeru SO2 no sanka hanno. IV). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 135, 1975. 2 refs. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

The oxidation and hydration of sulfur dioxide in ozone layer are discussed. The oxidation of SO2 occurs by four processes: the first involves the reaction between SO2 and oxygen to give sulfur trioxide; the second involves the reaction between SO2 and hydroperoxyl radical to give SO3 and hydroxyl; the third involves the reaction between SO2 and OH to give hydrogen sulfite; and the fourth involves the photon bombardment of SO2 to give SO3 via sulfate. The hydration of the reaction products occurs as follows: sulfuric acid plus water gives hydrated 1+2 SO4; the hydration proceeds until H2SO4(H2O)n is formed. The equilibrium constants of these hydration reactions are calculated and the relative density of H2SO4(H2O)n is estimated. Two hypotheses are adopted for the calculations: the existence of an equilibrium constant for each hydration reaction and the assumption that the rate of formation of the hydrates formed by the collision between H2SO4 and H2O is equal to the production rate of the embryo, which is thermodynamically obtained. The rate of hydration of the oxidation products of SO2 is very high.

52543 **APTIC NO. 74996**

Kitagawa, Hiroshi

ADSORPTION CHARACTERISTICS OF GASES ON ACTIVATED CARBON. *(Kasseitan no gasu kyuchaku tokusei). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(2):9-14, March 1975. 16 refs.*

The adsorption characteristics of activated carbons of different pore size distribution prepared from coal, wood, coconut shell, saccharose, furan resin, and phenol resin were investigated. The adsorption isotherms of methanol, acetone, carbon tetrachloride, and mesitylene were obtained. In the case of activated carbon prepared from saccharose and resins with pores consisting primarily of micro-pores, the adsorption isotherm of organic solvents can be expressed by the Dubinin-Radushkevich equation over wide ranges of relative pressure. In the case of activated carbon prepared from saccharose with pores of molecular dimension, the intrinsic volume of adsorption space at saturated vapor pressure varied with the type of adsorbate. As for the adsorption isotherm of activated carbons prepared from coconut shell, wood, and coal with ash component consisting of a large number of transitional pores, the experimental data deviated from the Dubinin-Rodushkovich equation at relative pressure above 0.2. The differential heat of adsorption varied little with type of adsorbate, and was in the range of 9-13 kcal/mole for CH3OH and CC14.

52544 **APTIC NO. 74943**

Kobayashi, Shigehiko, Kazuhide Miyazaki, and Michiaki Yamamoto

A METHOD OF MOLDING CATALYSTS. *(Shokubai no seikei hoho). Text in Japanese. (Mitsui Mining and Smelting Co., Ltd. (Japan)) Japan. Pat. Sho 50-15478. 2p., June 5, 1975. (Appl. May 4, 1970, 1 claim).*

A method of molding a catalyst containing manganese oxide and lead oxide for exhaust gas purification is described. Mixed powders of manganese dioxide and triplumbic tetroxide (100 parts) are mixed with 3 parts manganese nitrate. Water (85 parts) is thoroughly combined with 15 parts of the mixed powders and the mixture is molded by a molding machine with cylinders having a diameter of 10 mm. The pencil-type, molded products are cut into 3 mm pellets which are heated at

100 C for 10 hr. The resulting catalyst had an effective porosity of 25-30% and a relative strength of 9 kg, an increase of 450%. The carbon monoxide oxidation capacity was 10% greater than oxidation by a conventional method.

52545 **APTIC NO. 74874**

Nakatani, Shigeru and Chiryo Kakuda

THE RELATION BETWEEN ATMOSPHERIC ELECTRIC CONDUCTIVITY AND THE CONCENTRATIONS OF AEROSOLS AND RADON. *(Taiki denki dendodo to aerosol nodo, radon nodo ni tsuite). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 74, 1975. (Presented at the Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

The effects of the rate of ion pair formation and the atmospheric spiral diffusion on the electric conductivity of the atmosphere were investigated. It was assumed that the variation in the rate of ion pair formation was due to radioactivity present in the atmosphere. Using an ionization chamber with a capacity of 64 l, a continuous record was made of the radon concentration. The average aerosol concentration and the average aerosol particle diameter were measured with a Pollack nuclei counter and a diffusion box. Electrical conductivity was measured with a Geldien conductivity meter. The life of the ions was calculated from the aerosol concentration and the average particle diameter. No strong correlation existed between the radon concentration and the electrical conductivity. Natural atmosphere was first introduced into a large box and stored in the box for some time; the storage time was longer than the life of small ions. The effect of spiral diffusion was thus eliminated. The curves thus obtained clearly showed that the electrical conductivity was dependent on the rate of ion pair formation.

52546 **APTIC NO. 74472**

Nishiyama, R., Y. Satomi, H. Hosaka, H. Kagaya, K. Inaba, K. Niume, K. Mizudori, M. Iwata, M. Iguchi, and T. Oota

PREPARATION OF CATALYST CARRIER FOR HYDROGENATION AND DESULFURIZATION. *(Suisoka Datsuryu shokubai tantai no sezoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-3992, 7p., Feb. 13, 1975. (Appl. April 23, 1969, 1 claim).*

A preparation of alumina which can act as an efficient catalyst carrier in hydrogenation and desulfurization is described. Only the gamma-type structure of alumina has high efficiency as a catalyst carrier for the hydrogenation and desulfurization of hydrocarbon oil. This type of alumina was prepared as follows: aluminum hydrogel was prepared by hydrolyzing crushed aluminum alcoholate in 40-100 C water or alcohol of pH 7-9. The aluminum hydrogel was then rinsed with alcohol and dried at 120 C. The resulting aluminagel was ground a 50-100 micron powder, kneaded with 40% water for 2 hr, then molded and dried for a few hours at 120 C, then for 2-10 hrs at 300-350 C and finally for 2-6 hrs at 450-550 C. A desulfurization of greater than 76% efficiency was reported.

52547 **APTIC NO. 74915**

Nojima, Kazuhiro, Katsuhisa Fukaya, Shozo Fukui, and Saburo Sugano

STUDIES ON PHOTOCHEMICAL POLLUTION. II. FORMATION OF NITROPHENOLS BY THE PHOTOCHEMICAL SUBSTITUTION OF BENZENE. *(Kokagaku kogai no kenkyu. II. Benzene no kokagauteki chikan hanno ni yoru nitrophenol rui no seisei). Text in Japanese. Preprint, Japan Society of Pharmacy, Tokyo, p. 109, 1975. (Presented at the Japan Society of Pharmacy, Annual Meeting, 95th, Nishinomiya, Japan, April 4-6, 1975.)*

A mixture of 1000 ppm benzene and 500 ppm carbon monoxide was irradiated with light from a xenon lamp for 5 hr. A considerable amount of a yellow substance was noticed on the wall of the reaction vessel. It was dissolved with potassium hydroxide solution. By-products were removed by extraction with ethyl ether. The residual solution was acidified with sulfuric acid and extracted with ethyl ether. Then a yellow substance was obtained. This substance easily reacted with alkali and gave a dark yellow or yellowish-brown substance. The yellow substance became colorless on reduction with zinc and hydrochloric acid. The substance was postulated to contain hydroxyl, nitrogen dioxide, and nitric oxide radicals in its molecule. Examination with thin-layer chromatography showed that the yellow substance was a mixture of three substances. Comparison with authentic samples of nitrophenol and eight nitrosophenols indicated that the substances were para-nitrophenol, 2,6-dinitrophenol, 2,4-dinitrophenol. Authentic samples of these three phenols were then methylated to give volatile substances. These three substances showed physiological effects similar to those observed during photochemical smog episodes.

52548 **APTIC NO. 74333**

Pitts, J. N., Jr. and B. J. Finlayson

MECHANISMS OF PHOTOCHEMICAL AIR POLLUTION. *(Mechanismen der photochemischen Luftverschmutzung). Text in German. Angew. Chem., 87(1):18-33, Jan. 1975. 166 refs.*

Recent achievements in the study of mechanisms of photochemical air pollution are reviewed. Rapid conversion of nitric oxide to nitrogen dioxide; a reduction of the propylene concentration; acetaldehyde, ozone, and peroxyacetylnitrate formation; and a reduction of the NO2 and propylene concentrations were observed in a mixture composed of nitrogen oxide and propylene in the ppm range in air. Thee photolysis of nitrogen dioxide to NO and oxygen is regarded as the principal trigger of photochemical smog formation. Ozone is used up in reactions with olefins, NO, and NO2. Mixtures of ozone and olefins or of diluted automotive exhaust gases to which sulfur dioxide is added prior to irradiation form sulfuric acid aerosol in a short time after irradiation. Both native and electronically excited oxygen, as well as singlet oxygen react with olefins and arenes. The hydroxyl radical, an important factor in the chain reactions, may originate from reactions of electronically excited oxygen with water, hydroperoxyl radicals with NO, and from the photolysis of nitric acid. Little is known about the reactions of the hydroperoxyl radical (generated in the photolysis of aldehydes and the oxidation of alcoxy radicals) with organic compounds.

52549 **APTIC NO. 76640**

Sano, Taeko and Susumu Otake

STUDIES ON THE NO, CO FORMATION AT BOUNDARY LAYER OF COMBUSTED GAS. *(Kinensho kitai no kyokai soryu ni okeru NO, CO no seisei). Text in Japanese. Nippon Kikai Gakkai Ronbunshu (Trans. Japan Soc. Mech. Engrs.), 41(342:662-671, Feb. 1975.*

Numerical analysis was carried out for the laminar flow boundary layer which accompanies reactions of combusted gases on the wall of the flow path, and the effects of the wall without catalytic action were examined. The most decisive factors such as the viscosity coefficients and thermal conductivities of the gas components and the molecular diffusion coefficients were obtained from gas kinetic theory by approximating the molecular potential field as a rigid body potential. Nitric oxide concentration near the wall surface was lower than that in the main stream when the wall was cooled. Nitrogen and water vapor were not affected due to their high concentrations. However, carbon dioxide at high concentration increased near the wall as carbon monoxide concentration decreased. Atoms and radicals showed greater concentration variations near the wall.

52550 **APTIC NO. 74850**

Suzuki, S.

CHEMICAL REACTION OF ATMOSPHERE - PARTICULATES (NO. 2). *(Taiki kagaku hanno - ryushijo busshit-*

su). Text in Japanese. Sekiyu Gakkai shi (J. Japan Petroleum Inst. (Tokyo)), 18(4):70-80, April 1975. 63 refs.

Characteristics of atmospheric particulates are discussed. Heavy haze seen on the coast is attributed to large particulates (over 1 micron) which are formed when water drops evaporate. Particles which originate from the sea are larger than those which originate from land. Examples of mutual diffusion of pollutants originating from sea and land are given. Particles originating from land include those due to volcanoes, soil and rocks, combustion, organic vapors generated by plants, pollen, comets, and meteorites. Particles originating from human activities are complex. In non-urban areas, the ratio of sulfate to other constituents is greater than for urban areas, while the ratio of organics in urban areas is greater than non-urban areas. The concentration of Aitken particles in large cities is more than 10 times that in suburban areas and more than 100 times that around mountains or the sea. Aitken particles are more often attributed to human activities, and particles greater than 1 micron are more often attributed to natural phenomena.

52551 APTIC NO. 74869

Takamura, Tamio, Shoji Asano, and Giichi Yamamoto

EXPERIMENTS ON THE OPTICAL CHARACTERISTICS OF AEROSOLS. II. *(Aerosol no kogakuteki tokusei ni kansuru jikken. II.). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 137, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

Observations on the scattering of light by aerosols were made. A polar nephelometer was used for the observations and theoretically obtained phase function was compared with the experimentally obtained phase function. Mie theory was adopted for the analysis. The function was calculated for various combinations of the complex refraction coefficient and the particle size distribution. The imaginary part of the complex refraction coefficient was related to the absorption. Its effect was especially strong in the back-scattering portion of the phase function. The back-scattering was also dependent upon the size and shape of particles. Consequently, the determination of the complex part of the refraction coefficient was accompanied by difficulties relating to the effect of particle shape. In the present study, the particles were assumed to be spherical. If the particle shape is not spherical, the imaginary part of the refraction coefficient is too large. During actual observations, sample variation with time posed another difficulty. The change with time of the intensity of the scattered light was measured at a scattering angle of 30 deg.

52552 APTIC NO. 74928

Tanada, Seiki and Yoshihito Boki

THE EFFECT OF IRON COMPOUNDS IN ACTIVE CARBON ADSORBENT ON THE AMOUNT OF ADSORPTION OF TRIMETHYLAMINE. *(Kassei tan kyuchakuzai chu no tetsu kagobutsu no trimethylamine kyuchaku-ryo ni oyobosu eikyo). Text in Japanese. Preprint, Japan Society of Pharmacy, Tokyo, p. 125, 1975. (Presented at the Japan Society of Pharmacy, Annual Meeting, 95th, Nishinomiya, Japan, April 4-6, 1975.)*

The effect of iron compounds in activated carbon on the amount of trimethylamine adsorption was investigated. The content of the iron compounds was determined by fluorescence X-ray analysis. The peaks of iron-potassium alpha line in the fluorescence spectrograph indicated that the amount of adsorbed trimethylamine decreased as the iron content of the adsorbent increased. Even when the characteristics of the activated carbon were excellent, for example, the surface polarity and surface area were excellent for adsorption, the presence of iron compounds in the activated carbon promoted the decomposition of trimethylamine and resulted in a decrease in the amount of trimethylamine adsorbed.

52553 APTIC NO. 74563

Tsuruizumi, A.

THE MECHANISM OF ADSORPTION AND DEODORIZATION. I. *(Kyuchaku no kiko to dasshu). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(19):44-51, March 1975. 5 refs.*

Physical and chemical mechanisms of adsorption are discussed in relation to odor control. The most reliable theory on the mechanism of adsorption is that of F. London, modified by modern quantum mechanics. The theory is plausible even for the adhesive forces among molecules that have no permanent dipole. Further development of Londons theory is also described. The field of adsorptive power in activated carbon originates in the porous structure. Electronic consideration of the mode of bonding among carbon atoms reveals that sp2 hybrid orbitals play the most important role in adsorption.

52554 APTIC NO. 74855

Yanagihara, Shigeru, Isamu Shimada, Eiichi Shinoyama, Keizo Saito, Fumitake Chisaka, and Takeshi Ishii

PHOTOCHEMICAL REACTIONS OF GASES EXHAUSTED FROM AUTOMOBILES. *(Jidosha haishutsu gas nadono ko-kagaku hanno). Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 57-66, 1975. 4 refs. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

Studies on automobile exhaust gases and on photochemical reactions in a smog chamber (propylene-nitrogen oxide system) are reported. Little difference was found between the photochemical reactivities of exhaust gases resulting from the combustion of fuels with various compositions. Judging from the hydrocarbon/NOx ratio, the reactivity for the formation of ozone increased with an increase in the olefin content. In atmospheric air, the maximum concentration of ozone hardly exceeded 0.1 ppm, even after irradiation for 6 hr when the temperature was lower than 30 C, provided that the initial concentration of hydrocarbons other than methane was 0.4 ppm. In this case the initial concentration of NOx is independent of the final concentration of ozone. The specific gravity and the octane value of the fuels used ranged between 0.7204 and 0.7780 and 90.4 and 95.9, respectively.

52555 APTIC NO. 74991

Yano, Tadashi, Kieko Maebashi, Hidetsugu Katsuragawa, and Takayuki Takeuchi

SOURCES OF ATMOSPHERIC AEROSOL PARTICLES. *(Taiki erozuru ryushi no hasseigen). Text in Japanese. Preprint, Japan Isotope Society, Tokyo, p. 63, 1975. (Presented at the Isotope Research Studies in Science and Engineering, 12th Symposium, Tokyo, Japan, June 18-20, 1975, Paper 19p-III-12.)*

A method is described for determining whether atmospheric aerosol particles came from natural or artificial sources. Natural sources of aerosol are ocean salt particles and soil particles. Combustion of fossil fuels probably provides most of the aerosol particles from artificial sources. Elementary constituents of aerosols were determined by neutron irradiation analysis. Ratios of elements in the particles were based on the Al(Si) standard for soil particles, and the Na standard for ocean salt particles. Elements which are culprits in environmental pollution (sulfur, chlorine, zinc, arsenic, selenium, bromine, silver, cadmium, indium, antimony, mercury, and lead) were present in excessive amounts. Other elements (silicon, scandium, rubidium, cesium, barium, lanthanum, cerium, samarium, and thorium) have maintained their ratios to each other quite well, and factors are below 10. Particles from the earth s crust show tendencies to collect in particles greater than 1 micron in radius.

52556 **APTIC NO. 74703**

CARBON-12/C-13 ISOTOPE RATIO MEASUREMENT AS AN ENVIRONMENTAL POLLUTION INDICATOR. *(Taiki osen indikeita to shiteno 12C/13C doitai hi sokutei). Text in Japanese. Genshiryoku Kogyo, 21(5):60, May 1975.*

The carbon isotope ratio can be used an an index of air pollution, and atmospheric carbon dioxide can be used to determine the ratio. There are two methods of trapping gaseous carbon dioxide; a cold trap method with liquid nitrogen and a precipitation method with barium carbonate. The latter method tends to precipitate one kind of isotope more than the other; however, the former method traps carbon isotopes non-selectively and a 100% trapping of CO_2 can be expected. A typical delta C-13 value during daytime at residential areas is 8.35. Auto exhaust gas shows - 30.5 as the delta C-13 value and the value ranges from - 20.43 to - 14.02 for areas with automobile traffic. The delta C-13 value for heavy oils and natural gases ranges from -47 to -21; therefore, the measurement of carbon isotope ratios of atmospheric CO_2 near industrial areas would give the degree of air pollution.

52557 **APTIC NO. 74886**

Kanagawa Prefectural Environmental Center (Japan)

FORMATION OF GLYOXALS BY PHOTOCHEMICAL REACTION OF AROMATIC HYDROCARBONS IN THE COEXISTENCE OF NITROGEN OXIDES. *(Chisso sankabutsu kyozonka no hokozoku tankasuiso no kokagaku hanno ni yoru guriokisaru rui no seisei). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution, Yokohama-Kawasaki Ind. Area), no. 17:145, Feb. 1975.*

The photochemical reactions of benzene, toluene, o-, p-, and m-xylenes were studied under the presence of nitric oxide using a xenon lamp with radiation shorter than 300 nm filtered out. Each aromatic hydrocarbon was placed in a quartz reaction bottle and its concentration adjusted to 1000 ppm; NO gas was added at concentrations of 0, 50, 100, and 200 ppm. The reaction bottle was then irradiated for 1, 3, or 5 hr. The glyoxals in the reaction products were reacted with 4-chloro-o-phenylenediamine to produce 6-chloroquinoralines which were determined by gas chromatography with electron capture detector. The reactivities of the aromatic hydrocarbons were determined from both the amount of produced glyoxals and the amount of unreacted hydrocarbons. A small amount of glyoxal up to 3 ppm was produced from benzene, toluene, o-xylene, p-xylene, and m-xylene under reactions with 200 ppm NO and 5 hr irradiation. Dimethylglyoxal was produced only from o-xylene and the production was 7 ppm after 5 hr irradiation with 200 ppm NO. Methylglyoxal was found in the reaction products from toluene, o-xylene, m-xylene, and p-xylene, and their corresponding productions were 9 ppm, 18 ppm, 16 ppm, and 16 ppm under the presence of 200 ppm NO with 5 hr irradiation. Increased amounts of NO in the reaction bottle increased the amount of reaction products. When 1000 ppm hydrocarbon and 200 ppm NO were added to the bottle and irradiated for 5 hr, the unreacted amounts of hydrocarbon found were 700 ppm, 520 ppm, 400 ppm, 360 ppm, and 320 ppm for benzene, toluene, o-xylene, p-xylene, and m-xylene respectively. Therefore the photochemical reactivity of the hydrocarbons decreased in the order of m-xylene, p-xylene, o-xylene, toluene, and benzene.

1974

52558 **APTIC NO. 74598**

Borghi, Roland

ANALYTIC METHOD FOR PREDICTING CHEMICAL REACTION RATES IN THE PRESENCE OF AN INHOMOGENEOUS TURBULENCE (APPLICATION TO TURBULENT COMBUSTION). *(Methode analytique de prevision des taux de reaction chimique en presence d une turbulence homogene (application a la combustion turbulente)). Text in French. Preprint, Office National d Etudes et de Recherches Aerospatiales, Chatillon (France), 2p., 1974. 33 refs. (Presented at the AGARD Conference on Flow Processes Associated with Chemical Reactions, Liege, France, April 1-2, 1974.)*

A theoretical approach to the problem of the reciprocal influence between turbulence, i.e., random fluctuations in velocity, concentration, and temperature, and the chemical reactions is presented on the basis of a conventional method for the study of turbulence in inhomogeneous, non-reactive flows. The fluctuation evolution is followed and calculated by the evolution of second-order moments. The non-reactive, inhomogenous flow model is found to be applicable to the problem of reactive flows. The combination of numerical calculations with analytical studies permits a first quantitative calculation of the influence of turbulence in addition to the definition of the various phenomena involved. The chemical reaction taking place in an inhomogeneous turbulent flow influences the turbulence by increasing the temperature, affecting the diffusion due to turbulent processes, and influencing the generation or cessation of concentration and temperature fluctuations. The reduction of the chemical reaction rate due to concentration fluctuations is manifested in a prolonged combustion duration.

52559 **APTIC NO. 74599**

Brodskiy, A. A., N. N. Postnikov, S. B. Kapilevich, G. A. Chelebi, and I. A. Lobodyuk

INFLUENCE OF PHYSICOCHEMICAL PARAMETERS ON DISPERSE COMPOSITION OF CONDENSED AMMONIUM PHOSPHATE AEROSOL. *(Vliyaniye fizikokhimicheskikh parametrov na dispersnyy sostav aerozolya knodensirovannogo fosfata ammoniya). Text in Russian. DAN SSSR, 214(1):156-158, 1974. 5 refs.*

The effect of water vapor, the ammonia-phosphorus pentoxide ratio, and the reaction temperature on the disperse composition of ammonium phosphate aerosol encountered in ammonium polyphosphate manufacture was studied in the laboratory with an electron microscope. Changes in the ammonia-to-phosphorus pentoxide ratio from 2.1 to 2.9 at a reaction temperature of 300 C had no marked effect on the mean radius of the particles. A temperature increase from 300 to 400 C caused an increase in the mean particle radius from 0.76 to 1.6 micron. The diffusion coefficient increased with the temperature. The degree of polymerization also increased with temperature resulting in a decreased diffusion coefficient. A reduction of the particle size with a temperature rise to 500 C indicated the prevalence of the latter phenomenon. The introduction of water vapor into the reaction zone reduced the rate of condensation of ammonium phosphates. An aerosol with the largest particles was obtained at a reaction temperature of 400 C; the particle size was essentially independent of the ammonia-phosphorus pentoxide and water-phosphorus pentoxide ratios at this temperature. Electron microscopic studies revealed that the aerosol was composed of primary, nearly spherical particles, indicating the presence of a transient liquid phase in the solid aerosol formation. The primary particles formed linear chains, suggesting coagulation essentially due to electrostatic forces.

52560 **APTIC NO. 74647**

Chiba, Junji

ON THE PROPERTIES OF CALCIUM SULFATE DIHYDRATE (GYPSUM) OBTAINED BY TREATING STACK GAS WITH LIME-ABSORBENT (PART I) - STUDIES ON THE PROPERTIES OF INDUSTRIAL MINERALS. *(Haien datsuryu sekko no seijo ni tsuite (sono 1) kogyoyo genryo kobutsu no seijo ni kansuru kenkyu). Text in Japanese. Kogai Shigen Kenyusho Iho (Bull. Pollut. Resour. Res. Inst.), 4(1):47-62, May 1974. 16 refs.*

The chemical, physical and metallurgical properties of gysum obtained from flue gas desulfurization were examined. The gypsums consisted of swallow-tail and butterfly shaped twins and were poor in cleavage. The G1 and G2 gypsums obtained by neutralization-desulfurization and the G3 gypsum obtained by limestone methods contained fairly high concentrations of trace metals including aluminum, silicon, magnesium, and iron, while natural gypsum contained fairly high concentrations of zinc, aluminum, and vanadium. Gypsum of the G1 type was dehydrated at 140 C, whereas G2 and G3 dehydrated at 146 and 149 C, respectively, resulting in semihydrate forms. The correlation between the transition point and crystal modification was as follows: the monoclinic calcium sulfate semihydrate form was transformed to the hexagonal $CaSO_4$ semihydrate form at 110 C the hexagonal $CaSO_4$ semihydrate form was transformed to the hexagonal $CaSO_4$ form at 160 C; the hexagonal $CaSO_4$ form was transformed to the orthorhombic $CaSO_4$ form at 310 C.

52561 **APTIC NO. 74435**

Cointot, Andre, Pierre Cartraud, and Christian Clavaud

STUDY OF THE ADSORPTION OF NITROUS OXIDE BY DIFFERENT MOLECULAR SIEVES. *(Etude de l adsorption du protoxyde d azote par differents tamis moleculaires). Text in French. J. Chim. Phys., 71(5):765-770, 1974. 15 refs.*

Sets of adsorption isotherms of nitrous oxide on various zeolites (NaZ, HZ, 5A, NaX, and NaY) were measured thermogravimetrically over a pressure range of 1-760 torr and a temperature range of -100 to 200 C. By plotting the adsorbed amounts against the temperature at constant potential, it is possible to obtain curves of adsorbed phase density against temperature. A typical curve is obtained for each adsorbate-adsorbent system. Two adsorption ranges with different energetic features may be exhibited from the characteristic curve and isosteric heats of adsorption for zeolites 5A and NaZ. The density of the adsorbed phase varies nearly linearly between the triplet point temperature and the critical point of the adsorbate. The characteristic curves obtained for HZ, NaX, and NaY were found Gaussian.

52562 **APTIC NO. 74860**

Hayashi, Hiroshi

A THEORETICAL ANALYSIS OF THE EFFECTS OF THE ATMOSPHERE ON AUTOMOTIVE EMISSIONS (THE EFFECTS ON THE AIR/FUEL RATIO, COMBUSTION GAS CALORIC VOLUME AND GAS COMPOSITIONS). *Text in Japanese. Preprint, Japan Society of Automotive Engineers, Tokyo, p. 333-342, 1974. 11 refs. (Presented at the Japan Society of Automotive Engineers Lecture Meeting, Tokyo, Japan, Oct. 15-17, 1974, Paper 45.)*

Variation of air/fuel ratio (A/F) was calculated between 960 millibar and 1080 millibar pressure by setting an apparent A/F at normal conditions of 1030 millibar, 25 C, and 75 grain water/lb dry air. At an apparent A/F of 14 at normal conditions, the variation of the A/F was -0.37 at 960 millibar and +0.46 at 1080 millibar. The variation increased with increasing apparent A/F at normal conditions. The apparent A/F was estimated in a similar way by setting A/F at given pressures, and the variation of exhaust concentration was corrected from the relation of exhaust concentration and A/F at normal conditions. At high apparent A/F, the correction was much greater. A positive-value correction of exhaust concentration was obtained at low pressure. The variations of A/F from 10 C to 40 C were calculated in the same manner. The variation of apparent A/F at 10 C, 20 C, 30 C, and 40 C were +0.37, +0.12, -0.11, and -0.34, respectively. The variation also increased with increasing A/F. Contrary to the effect of pressure, a negative-value correction was obtained at low temperature. The variation of apparent A/F at different humidities was small, but that of dry A/F was greater. The calculations did not explain the generally agreed concept that humidity reduces nitric oxide formation.

52563 **APTIC NO. 74454**

Kato, K., C. Kurata, K. Mori, and K. Fujii

GENERATION OF AND HOW TO REDUCE FUEL NO_2. *(Fuel NO no seisei to sono teigenho ni tsuite). Text in Japanese. Preprint, Japan Combustion Assoc., Tokyo, 4p., 1974. 7 refs. (Presented at the Japan Combustion Association Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

Using a premixed plane flame of various fuels, problems of fuel nitric oxide generation were studied. The fuels used were hydrogen, methane, hydrogen plus carbon monoxide, hydrogen plus methane, and carbon monoxide plus methane. During premixed combustion with excess air the composition of the fuel did not appreciably affect the conversion rate of ammonia to NO. As the flame received more fuel, the conversion rate decreased. The conversion rate of a CO flame was higher than for other fuel flames due to the fact that fuel nitrogen decomposition is quick, with very little hydrogen cyanide or NH_3 remaining. Nitric oxide added to premixed gas is emitted as nitrogen oxides when combustion takes place with excess air. In fuel excess flames (CO flame), added NO hardly decomposes. In H_2 flames, some NO decomposes. In flames containing CH_4 more decomposition takes place. In fuel excess hydrocarbon flames, NO is promptly generated and added NO is decomposed. Decomposition of NO in a fuel excess H_2 flame is due to the fact that a part of the added NO is converted into such nitrogen compounds as NH_3, at least temporarily in the flame belt area.

52564 **APTIC NO. 74982**

Lushnikov, A. A. and A. G. Sutugin

INFLUENCE OF THE MOLECULAR FORCES ON THE COAGULATION OF HIGHLY- DISPERSED AEROSOLS. ROLE OF THE RETARDATION AND NONADDITIVITY OF INTERACTIONS. *(Vliyaniye molekulyarnykh sil na koagulyatsiyu vysokodispersnykh ayerozoley. Rol apazdyvaniya i neadditivnosti vzaimodeistvii). Text in Russian. Kolloidn. Zh., 13(3):566-569, March 1974.*

A formula has been worked out, which is similar to Hamaker s, that describes the potential of the retardation of London s forces between 2 spherical particles. The formula is good for values not higher than 3/2 pi of the length of London s wave. From the utilization of this potential, the integrals of the collision between the spherical particles of both equal and different dimensions have been calculated. Thus, a wide range of ratios of Hamaker s constant towards the mean energy of the particles relative movement has been considered. It has been established that the retardation of molecular forces decreases very little their effect on the coagulation of highly dispersed particles in the free molecular flow. The relative effect of the nonadditivity of molecular forces shows more strongly in the range of small values of Hamaker s constant ratio to the mean energy of the thermal motion of the particles. The influence of the retardation and nonadditivity of molecular forces can be considered to be independent due to their small size. The agreement between the theory of the coagulation kinetics of highly dispersed aerosols and experiment is considered satisfactory.

52565 **APTIC NO. 74452**

Mori, Y., T. Miyauchi, M. Hanzawa, and M. Sekiguchi

STUDY ON NO GENERATION REACTION BY ESR. *(ESR ni yoru NO seisei hanno no kenkyu). Text in Japanese. Preprint, Japan Combustion Assoc., Tokyo, 4p., 1974. 4 refs. (Presented at the Japan Combustion Association Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

The generation mechanism of nitrogen oxide was investigated by measuring the temperature distribution of a premixed primary flame of methane-oxygen-nitrogen and the temperature distribution of oxygen, hydrogen, and NO concentration. Electron spin resonance was used for the measurements. It was confirmed that 0 atoms of 0.21-0.11 mol% and H atoms of

0.18-0.12 mol% existed. When the equivalent ratio increased, the maximum concentration of atomic O and H decreased; however, the concentration of NO increased.

52566 **APTIC NO. 74453**

Mori, Y., K. Otake, and S. Hirasawa

BASIC STUDY ON NO GENERATION BY REDUCED PRESSURE COUNTERFLOW DIFFUSION FLAME. *(Genatsu taikoryu kakusan kaen ni yoru NO seisei no kisoteki kenkyu). Text in Japanese. Preprint, Japan Combustion Assoc., Tokyo, 4p., 1974. 1 ref. (Presented at the Japan Combustion Association Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

The effects of pressure and oxygen and nitrogen concentration on the generation of nitric oxide accompanying combustion were studied using a counterflow diffusion flame with methane as the fuel. There was a sharp change in NO concentration at maximum flame temperature. This indicated that with an equivalent ratio of one, the generation mechanism of NO greatly differs between the leaner fuel side and the richer fuel side. For the leaner fuel side at maximum flame temperature, the speed of the total generation of NO fits a quadratic equation and is proportional to the nitrogen concentration. On the richer fuel side at maximum flame temperature, the generation speed NO fits a linear equation and is proportional to the nitrogen concentration with little dependency on temperature and oxygen concentration.

52567 **APTIC NO. 74421**

Okutani, Takeshi, Ryusaburo Furuichi, and Tadao Ishii

REACTION OF SOLID SODIUM ALUMINATE WITH SULFUR DIOXIDE. *(Koso Aruminsan natoriumu to nisanka iou no hanno). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc., Japan), 8(12):2303-2308, 1974. 7 refs.*

The reaction between solid sodium aluminate, one of the binary metal oxides, and sulfur dioxide was studied using a gas flow reactor. The sodium aluminates were obtained by evaporating sodium aluminate solutions with sodium oxide/alumina in a mole ratio between 0.5 and 3.0, which were prepared by dissolving various amounts of metallic aluminum in sodium hydroxide solution. The reaction behavior and mechanism of sodium aluminate with SO_2 were examined at 330 C and 130 C. In the sodium aluminate reaction with excess sodium, the rate of the initial stage was fast and the reaction in this stage was between SO_2 and $NaOH$. An approximately linear relationship existed between the reaction rate and the amount of $NaOH$ in the sample. The rate of the latter stage was slow, and the reaction was between $Na_2Al_2O_4$ and SO_2. The rate of the reaction increased with an increase in temperature. The overall reaction may be expressed by four simple chemical reactions. With regard to the formation of sodium sulfate, alumina, which was formed from the reaction between sodium aluminate and SO_2, promoted the oxidation of sodium sulfite.

52568 **APTIC NO. 74697**

Osumi, M. and T. Kunitomo

THEORETICAL CALCULATION OF ABSORPTION COEFFICIENT OF SULFUR DIOXIDE BAND. *(Aryusangasu bando no kyushu keisu no riron keisan). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 5-8, 1974. 7 refs. (Presented at the Japan Society of Mechanical Engineers Meeting, 846th, Tokyo, Japan, Nov. 18-19, 1974.)*

The structure of the infrared absorption band of sulfur dioxide is discussed in detail and the absorption coefficient, S/d, is calculated for estimation of the radiant absorption characteristics of SO_2 at high and low temperatures. The S/d coefficient is compared to the infrared wave number and theoretical results are compared to experimental results.

52569 **APTIC NO. 74622**

Pattenden, N. J.

THE MEASUREMENT OF HEAVY METALS IN THE ATMOSPHERE AND THEIR INTERPRETATION. *Preprint, National Society for Clean Air, Brighton (England), 22p., Oct. 1974. 12 refs. (Presented at the National Society for Clean Air Annual Conference, 41st, Cardiff, Wales, Oct. 14-18, 1974.)*

The measurements of concentrations of heavy metals and other elements in suspended airborne dust and in dust deposited dry and in rain are described. The analytical method used was primarily instrumental neutron activation analysis. This was supplemented by X-ray fluorescence for nickel and lead, and in cases of solutions by colorimetric methods for copper and lead. Atomic absorption spectrophotometry was used for nickel. The elemental composition of atmospheric particulate material was much the same regardless of where in Britain it was collected. The chief exceptions to this rule were cases where a station, being close to the sea, collected a large sea spray contribution under certain conditions. An Andersen Cascade Impactor Sampler was used to measure particle size at Trebanos (Wales). Results indicated that there were three distinct groups of elements which behaved similarly. Vanadium, nickel, arsenic, selenium, lead and antimony behaved similarly, as did chromium, manganese and cesium. Cobalt, scandium, iron and cerium all showed a maximum at the same level.

52570 **APTIC NO. 74492**

Shimizu, M.

COMPOSITION OF GAS AFTER COMBUSTION AND ITS PRESSURE. *(Nenshogo no gasu sosei to sono atsuryoku ni tsuite). Text in Japanese. Preprint, Japan Combustion Assoc., Tokyo, p. 147-150, 1974. 3 refs. (Presented at the Japan Combustion Association Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

Different pre-mixed gases (acetylene-air- and methane-air) were burned in a constant volume apparatus at atmospheric pressure and temperature. After combustion and elapse of sufficient time for gas temperature to return to that of the atmosphere, the pressure of the gas was measured. The test results were compared with a theoretical analysis in which the mixed gas and burned gas were considered to be complete gases. The burned gas was analyzed to seek the relationship between the components of the burned gas and its pressure. When the acetylene mixture was burned, hardly any oxygen was detected for 4.5%, 7.5% and 19.8% mixtures due to incomplete combustion. Carbon monoxide showed a maximum at a 19.4% mixture ratio. In the methane mixture, carbon dioxide increased when the oxygen was sufficient. No CO was detected for the theoretical mixture. Hardly any oxygen was detected when more methane was mixed. Carbon monoxide increased as the mixture ratio increased, while CO_2 decreased. The CO percentage curve and pressure curve were very close up to a 36% mixture, and around 19.4% both reached their peaks. For mixtures over 36%, CO decreased due to oxygen shortage, and the pressure fell at lower ratios. Methane, at higher mixture ratios after combustion, showed increased CO evolution. The relationship of CO to pressure after methane combustion at a 9.7-13.0% mixture ratio was approximately linear.

52571 **APTIC NO. 74396**

Takeyama, Kenichi, Takayoshi Morimoto, and Fumiya Konishi

COMPOSITION OF GASEOUS COMBUSTION PRODUCTS OF PLASTICS. *(Purasushikku no nensho gasu sosei) Text in Japanese. Nat. Tech. Rep. (Matsushita Electr. Ind. Co., Osaka), 20(5):562-569, Oct. 1974. 8 refs.*

The composition of gaseous combustion products of plastics was investigated with a combustion apparatus consisting of a quartz combustion chamber placed in an electric furnace and a piston cylinder type gas collector. Eleven types of plastic and one wood sample were burned with varied supply rates of the air, and the composition products were determined by infrared analysis and gas chromatography. The gaseous combustion products identified were carbon dioxide, carbon monoxide, nitrogen dioxide, ammonia, hydrogen cyanide, sulfur dioxide, hydrogen cyanide, sulfur dioxide, hydrogen chloride, and hydrocarbons. Based on the general composition of the gaseous combustion products determined, the amount of toxic gases produced by the combustion of these plastics can be estimated.

52572 **APTIC NO. 74456**

Toyama, I., H. Sano, and T. Nakamura

GENERATION CONDITIONS OF NOX IN HYDROGEN BURNER. *(Suiso bana ni okeru NOx hassei joken). Text in Japanese. Preprint, Japan Combustion Assoc., Tokyo, 4p., 1974. 2 refs. (Presented at the Japan Combustion Association Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

The generation of nitric oxide by hydrogen flames was studied and compard with that generated by other fuels. Using a premixture burner with hydrogen, city gas, and propane gas as fuels, the gneration of NO was measured. In the case of city gas, NO generation from a small burner was 30-50 ppm; it was 50-100 ppm for flames and 80-150 ppm for short flames. Similar values were observed for propane. With hydrogen fuel (3-6 l/min, primary air volume, 0.1-4 l/min) NO was 200 ppm, close to that for light oil. At the lowest NO range (less than 1 l/min fuel and over 8 l/min primary air volume), it was still 20 ppm, higher than the minimum for city gas and propane gas. With increased air volume, less NO was generated from hydrogen flames.

52573 **APTIC NO. 74608**

Volk, Michael, Jr.

AEROSOL COAGULATION IN AN ACOUSTIC FIELD (TECHNICAL REPORT). *Pennsylvania State Univ., Dept. of Mechanical Engineering, Univ. Park, Office of Air Programs Grant T90011, Center for Air Environment Studies Rept. 343-74, March 1974, 80p. 40 refs.*

The behavior of an aerosol in a sound field was studied using carbon black. The feasibility of using sonic agglomeration at low sound pressure levels (100 to 120 dB) to coagulate particles was the primary objective of the study. Separate experiments to determine the effect of varying sound pressure level, frequency, particle mass loading in an air stream, and exposure time were conducted. Increased agglomeration size resulted from an increase in mass loading, sound pressure level, and exposure time. For all tests, optimum growth occurred at 3 kHz. The mean particle diameter in a carbon black aerosol can be increased an order of magnitude using sonic agglomeration at low sound pressure levels, suggesting that this mechanism can be used effectively in industrial processes.

52574 **APTIC NO. 74635**

Wagner, H. M.

ANIMAL EXPOSURE EQUIPMENT FOR STUDYING THE EFFECT OF AIR POLLUTANTS. *(Tierexpositionseinrichtungen fuer Untersuchungen zur Wirkung von Luftverunreinigungen). Text in German. Schriftenreihe Ver.-Wasser-Boden-Lufthyg. (Berlin), (41):217-223, 1974. 5 refs.*

A new type of animal inhalation exposure chamber is described. The maintenance of a high air change at a low air speed is made possible using the principle of a horizontal air flow, by conducting air through perforated steel plates on both sides of the chamber. The system allows a great variability of these parameters, without changing the general characteristics of the air flow pattern. The chambers, made of stainless steel with a volume of about 2 cu m, are supplied with purified, tempered air of constant humidity. Warning devices are installed to compensate for failure of equipment. Each unit has a maximum capacity of 150 rats. These animal exposure facilities are being used to study long-term effects of atmospheric pollutants and have been operating successfully for over three years.

1973

52575 **APTIC NO. 76681**

Dvornik, Josef

ON THE REASONS FOR THE ALTERATION OF SOME PHYSICAL PROPERTIES OF FLUE DUST. *(Prispevek k objasneni diskretnich pricin zmen nekterych fyzikalnich vlastnosti letavych popilku). Text in Czech. Acta Univ. Agr. Brno Fac. Silvicult., 21(3):489-493, March 1973. 5 refs.*

Microscopic examination of the flue dust from one heating plant and three power plants revealed the presence of spherical particles which changed the apparent specific weight and weight by volume of the dust. Changes in these two properties, resulting from the crushing of particles and washing with water in proportion 1:20, were measured, using selected samples of ash. Crushing increased both the specific and the volume weight of the ash. Washing with water decreased both weights of the ash. Extraction of water-soluble substances also decreased the hygroscopicity and changed the physical composition of the ash, primarily by increasing the particle size fraction of 0.05 to 0.01 mm.

52576 **APTIC NO. 74654**

Suzuki, Shin and Nobutoshi Horiuchi

PHOTOCHEMICAL REACTION OF SULFUR DIOXIDE--NITROGEN OXIDES. *(Aryusan gasu-chisso sankabutsu-kei no kokagaku hanno). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Environ. Sci. Res. Rep., Chiba Univ.), 1(1):165-177, July 1973. 6 refs.*

The reactions between sulfur dioxide and nitrogen oxides in light and dark were investigated. A high-pressure mercury lamp was used as the light source for photochemical reactions. The reaction products were separated by thin layer chromatography and analyzed by means of infrared absorption spectra. During the reaction, there was an initial volume increase, followed by a volume decrease in the gaseous phase. A white hygroscopic condensate formed, which liquefied upon exposure to the atmosphere overnight. Since nitrosyl sulfuric acid (NOHSO4) was formed as the end product, the presence of (SO3)2N203 was a distinct possibility. The reaction product also reacted with the chromatography solvent, tetrahydrofuran. Mass spectrometer readings were taken, but the compounds formed could not be ascertained. From the dark reaction between SO2 and NOx, it was deduced that sulfur trioxide and SO2NO were formed. The dark reaction between SO2 and NOx at atmospheric pressure occurs slowly but steadily in the presence of moisture.

52577 **APTIC NO. 74655**

Suzuki, Shin and Nobutoshi Horiuchi

PHOTOCHEMICAL REACTION OF SULFUR DIOXIDE GAS--ACETONE GROUP. *Aryusan gasu-aseton-kei no kokagaku hanno). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Environ. Sci. Res. Rep., Chiba Univ.), 1(1):153-163, July 1973. 9 refs.*

Photochemical reactions induced by a high pressure mercury lamp in a mixture of sulfur dioxide gas and acetone were investigated at a reaction temperature of 15 C. The products were analyzed by means of thin layer chromatography, gas chromatography, and infrared absorption spectra. Acetone, under ultraviolet radiation, forms methane, ethane, and carbon monoxide. In the presence of SO2 gas, the formation of ethane and CO was more or less suppressed, but the decomposition of acetone was not. A black-brown material was obtained as the result of the reaction. This black-brown material reacted with tetrahydrofuran solvent to form crystals, but did not crystallize with acetone. It was assumed that this material was an SO compound, but the exact structure is still unknown.

52578 **APTIC NO. 74659**

Suzuki, Shin and Nobutoshi Horiuchi

PHOTOCHEMICAL REACTION OF SULFUR DIOXIDE GAS--CIS BUTENE 2 GROUP. *(Aryusan gasu-shisu-buten-2-kei no kokagaku hanno). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Environ. Sci. Res. Rep., Chiba Univ.), 1(1):145-151, July 1973. 3 refs.*

The photochemical reaction in the atmosphere of sulfur dioxide with cis-butene-2 and trans-butene-2 was simulated in the laboratory. When SO2 absorbs light and is excited from the singlet to the triplet level, it can collide with cis-butene-2 (trans-butene-2) to effect a cis-trans (trans-cis) isomerization of the butene. The reaction vessels were made of quartz, Vycor, or hard glass. The light source was a high-pressure mercury lamp. Irradiation time ranged from 15 min to 10 hr, at which time a stationary level of isomerization (50-60%) occurred. The products of the irradiation (gaseous and aerosol) were analyzed by gas chromatography and infrared spectra. Cis-trans isomerization occurred with greater frequency than the trans-cis isomerization. Cis-trans isomerization continued in a dark place even after irradiation was stopped. A stationary isomerization level of 10-15% was reached after 10 hours. Aerosol material generated in the photochemical reaction settled in the bottom of the vessel as polymeric material (m/e greater than 470).

1967

52579 **APTIC NO. 74594**

Pred iu, C.

NON-PLATINUM CATALYSTS FOR OXIDATION OF AMMONIA TO NITROGEN OXIDE. *(Catalizatori neplatinici pentru oxidarea amoniacului la oxid de azot). Text in Romanian. Rev. Chim., vol. 18:136-140, 1967. 20 refs.*

Non-Platinum catalysts were used for the oxidation of ammonia to nitrogen oxide. The experimental equipment consisted of two cylinders filled with calcium chlorate and silica gel, a mixing room where air was mixed with ammonia, a cylinder in which air was mixed with ammonia after purification for oil traces via passage over a layer of activated charcoal, a cylinder in which the mixture was heated, and a stratum of catalyzers in a 20-millimeter diameter quartz tube on a ceramic sieve. The temperature of the system was measured by means of a thermocouple consisting of platinum and platinum-rhodium placed directly under the ceramic sieve and linked to a millivoltmeter. Preheating of the gases and bringing the catalyst up to reaction temperature were achieved by means of electrical resistance. The ammonia content of the air-ammonia mixture and the nitrogen oxide in the nitrous gas mixture were determined by means of vacuum balloons. Gas samplers were taken before and after passage through the catalyst. The only non-platinum catalyst which was competitive with a platinum one was cobalt oxide without admixtures. Other catalysts substituted for platinum only partially necessitated the presence of one or even two platinum sieves in the burning unit. The longest period of exposure was 6 days, 8 hr/day. The conversion efficiency of the pure cobalt oxide catalyst was between 90.2% and 96.7%, while with chromium or other admixtures it did not exceed 66.0% for 71.5% to 86.5% ammonia.

EFFECTS-HUMAN HEALTH

1975

52580 **APTIC NO. 74671**

Abe, Kazuo and Atushi Otani

INFLUENCE OF AIR POLLUTION ON RESPIRATORY SYSTEM IN ISOGO WARD, YOKOHAMA CITY. PART 3. MORBIDITY OF RESPIRATORY SYMPTOMS IN 1972 AS COMPARED TO THAT IN 1967. *(Yokohamashi isogo-ku ni okeru taikiosen no kokyuki ni oyobosu eikyo. Part 3. Showa 47 nendo no kokyukishojo yushoritsu oyobi showa 42 nendo yushoritsu to no hikaku). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 22(6):333-347, June 1975. 22 refs.*

The respiratory disease state of inhabitants older than 40 yr in the Isogo Ward of Yokohama, Japan was investigated in 1972 by the same method used in 1967. Morbidity was higher in men than in women, higher in older persons than in younger persons, and higher in smokers than in non-smokers. Continued cough and sputum syndrome was found in 7.1% of the men and 4% of the women, all of them appearing to have chronic bronchitis. Serious chronic bronchitis was as low as 1%. Lung function values were lower than those anticipated. Compared with data from 1967, morbidity in the form of cough and sputum and complications in 1972 was higher; however, severe symptoms of complication resulting from continued cough and sputum showed no difference. There was an increase in the number of old persons with lower lung function; inhabitants in their forties showing cough and sputum and complications of both symptoms increased from 3.2% (in 1967) to 5.0% for 1972. The chronic effect of air pollution appeared to be reflected by these figures.

52581 **APTIC NO. 74327**

Fujii, N. and K. Nishiyama

MANGANESE CONTENT OF THE HAIR OF NORMAL PERSON. *(Seijo-ji no mohatsu mangan ryo ni tsuite) Text in Japanese. Shikoku Koshueisei Gakkai Zasshi (J. Shokoku Soc. Public Health), 20(1):84-85, Feb. 1975.*

The manganese content of the hair of persons not specifically exposed to the metal was examined to investigate factors affecting hair Mn content. Specimens of hair were collected at times of haircutting from persons living in three cities, Tokushima, Anan, and Sakaide and were washed with neutral detergent solution. The average content of manganese in hair was about 2.5 times higher in women than in men. The reason why female hair contained more manganese was assumed to be due to adsorption of environmental manganese. The age-change of manganese content was negative in men and positive in women. The time change of manganese in hair was not significant intrapersonally but was significant interpersonally, suggesting that the amount of manganese in an individual s hair is constant. The population for the present study did not show effects specific to air pollution exposure. The normal value of manganese content in the hair was 0.88 micrograms/g for men and 2.21 micrograms/g for women.

52582 **APTIC NO. 74517**

Fujimura, N.

REPORT OF INVESTIGATION ON OTORHINOLARYNGOLOGICAL DISEASES AMONG PUPILS IN ARAO CITY FROM THE VIEWPOINT OF AIR POLLUTION. *(Arao shi jido seito no jibiinkoka shikkan chosa hokoku - Taikiosen no Kantenkara). Text in Japanese. Nihon Jibi Inkoka Gakkai Kaiho (Jap. J. Otorhinolaryngol. Soc.), 78(6):545, June 1975.*

Otorhinolaryngological diseases were assessed by questionnaire and medical examinations of pupils in Arao Japan. The data indicated a decrease in the disease which corresponded to a decrease in air pollution in the city. In order of decreasing incidence were rhinitis, allergic rhinitis, and eczema. This tendency was recognized for a difference of + or - 1% but not 5%. The relationship between morbidity and distance from the pollution source showed the same tendency.

52583 **APTIC NO. 74465**

Fukuoka, S.

PHOTOCHEMICAL SMOG PHENOMENA AND PLANT DAMAGE DUE TO THEM IN TOKYO. *PART I. PRESENT STATE OF PHOTOCHEMICAL SMOG IN JAPAN. (Tokyo ni okeru kokagaku smoggu gensho to shokubutsu higai; Dai 1-sho. Wagakunini okeru kokagaku smoggu no genjo). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 34:3-11, March 1975*

Oxidant concentrations of more than 0.15 ppm/hr in April and 0.22 ppm/hr in July of 1969 and more than 0.15 ppm/hr up to July 1970 were recorded in Tokyo. The first case of human injury was reported in July 1970 in the western part of Tokyo. The distribution of injuries due to photochemical oxidants ranges from many cities in Miyagi Prefecture, in the north to Hiroshima and Ehime Prefecture in the southwest. The number of photochemical smog victims during from 1970 to 1974 was about 50,000; however the number is decreasing, with the peak being 28,223 in 1971. A comparison of primary and secondary pollutants in Tokyo and Los Angeles revealed the following: oxidant concentration was generally higher in Los Angeles; nitric oxide concentration in Tokyo was 1/2 to 1/3 that in Los Angeles, nitrogen dioxide levels in Los Angeles were seven times higher than those in Tokyo, and carbon monoxide levels in Los Angeles were three times those in Tokyo. Correlations between oxidant, NO, NO2 and CO concentrations in both cities are compared.

52584 **APTIC NO. 74331**

Hirao, F., N. Kono, S. Takamaru, A. Kishi, Y. Takahashi, T. Furukawa, M. Miyao, H. Kondo, and K. Takeda

RESULTS OF INVESTIGATION ON INFANTILE PATIENTS OF BRONCHIAL ASTHMA IN TOKUSHIMA PREFECTURE. *(Tokushima-ken no okeru kikanshi-zensokuji chosa seiseki). Text in Japanese. Shokoku Koshueisei Gakkai Zasshi (J. Shikoku Soc. Public Health), 20(1):35-39, Feb. 1975. 13 refs.*

Infantile asthma was investigated in the industrial eastern parts of Tokushima Prefecture among 40,985 primary schoolchildren, using questionnaires, medical examinations, and roentgenography. Air pollution was continuously monitored. The total number of patients diagnosed with asthma was 354 (0.89%), with the local frequency of asthma in children ranging from 0.63 to 2.46%. No correlation was detected between the frequency of finding asthmatic children and the concentration of atmospheric sulfur oxides at their residential location. Clinical analysis of 209 children with relatively frequent asthmatic paroxysm showed that they had high percentage of allergic histories such as asthmatic bronchitis, eczema, urticaria, and strophulus infantum (in descending order). Paroxysm was more frequent in autumn and the first paroxysm occurred usually between the ages of 0 to 5 yr. The relationship of bronchial asthma to air pollution was negative.

52585 **APTIC NO. 74368**

Holma, Bo

SULPHUR DIOXIDE IS JUST AN INDICATOR OF THE TOTAL POLLUTION SITUATION. *(Luftforureningsindikatorn SO2). Text in Swedish. Kem. Tidskr., 87(1-2):74-75, Feb. 1975. (Presented at the ELMIA Environmental Exhibition, Jonkoping, Sweden, 1974.)*

The significance of sulfur dioxide as a pollution indicator is discussed. No correlation between morbidity or mortality and the ambient SO2 concentration is established (for SO2 alone), not even at concentrations measured during catastrophic accidents. Animal tests reveal no damage of the respiratory tract of Guinea pigs and monkeys exposed to 5 ppm free SO2 for several weeks. However, SO2 is harmful at much lower concentrations in the presence of respirable particulates, especially when the latter are present in humid air. These findings, as well as the epidemiologically established relationship between SO2 concentrations in air and increased respiratory morbidity, indicate that SO2 exerts its harmful effects mainly by adsorption on respirable particles which penetrate the deeper sections of the respiratory tract; free SO2 is adsorbed by the nasal mucosa. Thus, particulate abatement, in addition to SO2 control, is necessary to reduce the harmful effects of air pollution.

52586 **APTIC NO. 74589**

Iwabuchi, H. and S. Igari

REPORT OF INVESTIGATION CENTERED ON EXAMINATION OF LUNG FUNCTION OF SCHOOLCHILDREN IN AIR POLLUTED AREA OF IWAKI CITY. *(Iwaki-shi taiki osen chiku gakudoseito no haikino o chushin to seru chosakekka hokoku). Text in Japanese. Nihon Saigai Igakkai Kaishi (J. Japan Accident Med. Assoc.), 23(4):245, April 1975.*

A group of 186 children from an air polluted area of Iwaki, Japan showing abnormal medical findings and 96 children in a non-polluted area were examined with spirometer for lung function. The degree of air pollution was far lower than that in Tokyo-Yokohama-Chiba, Kansai, Seto coast, and North Kyushu, sulfur dioxide was a little higher than the value of the new environmental standard. The percentage of chilren showing abnormal blood sedimentation was twice as high in the air polluted area as in the non-polluted area. The percentage of children with abnormal lung function (forced expiratory volume) was the same in both areas, although other respiratory functions differed between the two areas. The number of asthmatic bronchitic children 49 (0.546%) in the polluted area and 21 (0.354%) in the non-polluted area. These figures were no greater than those for other normal areas.

52587 **APTIC NO. 74680**

Iwase, S.

PHOTOCHEMICAL SMOG, INJURIES AND CLINIC. *(Kokagaku smog higai to rinsho). Text in Japanese. Shonika (Pediatrics), 16(5):527-536, May 1975. 15 refs.*

Symptoms and injuries due to photochemical smog in Japan are reported along with experiments in which laboratory animals were exposed to ozone or oxidants. Among 275 investigated cases, 104 cases showed no symptoms; 86 cases which complained of topical symptoms showed some mucosal irritation. The reason why some victims did not show topical symptom appeared due to orthostatic dysregulation at the beginning of acute injury from photochemical smog. Studies investigating the relationship of smog to lung carcinogenesis are also discussed. The relationship between oxidant injury and abnormal electroencephalograms is supported by changes in the central nervous system due to chronic ozone exposure.

52588 **APTIC NO. 74340**

Jinbo, Genji

NEW ASPECT OF POLLUTION BY DUST. *(Funjinni yoru osen no atarashi men). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(1):58-59, Jan. 1975.*

The status of dust pollution is reviewed. Low boiling metals form sub-micron aerosols through evaporation-condensation processes, and ordinary dust collectors do not effectively collect such particles. The effect of metal particles smaller than 1 micron on human beings appears to be important based on recent studies. Also, the effect of sulfur dioxide on humans increases in the presence of dust.

52589 **APTIC NO. 74507**

Kawai, Kiyoyuki

RESPIRATORY INFECTION OF LABORATORY ANIMALS IN AIR POLLUTION RESEARCH. *(Jikken-*

dobutsu no kokyuki kansen - taiki osen dobutsu jikken). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(4):695-701, Feb. 1975. 7 refs.

Respiratory infection in laboratory animals used in air pollution research is discussed. Topics covered include: the role of the external and internal microbiological environment; the effect of the infection on respiratory diseases such as asthma, chronic bronchitis, pulmonary emphysema, and lung cancer; and the interferring effects of respiratory disease in experimental animals. The state of infection in animal rearing facilities, especially that of latent infection, is described in relation to false positive results during exposure studies. Animal losses caused by respiratory infection are discussed in relation to the facilities, experimental methods, and routes of infection. The prevention of infection in laboratory animals, especially in air pollution experiments, is discussed.

52590 **APTIC NO. 74326**

Kawasaki, M.

EXAMINATION OF DIRECT CAUSES OF DEATH OF OFFICIALLY RECOGNIZED PATIENTS SUFFERING FROM ENVIRONMENTAL NUISANCE (POLLUTION). *(Kogai nintei kanja no chokusetsu shi-in no kento). Text in Japanese. Min-I-Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 38:79, Feb. 1975.*

The number of patients with obstructive respiratory disease due to environmental pollution is increasing each year. A clinical classification of the direct causes of the death of such patients in Osaka was prepared according to the following: heart failure (cor pulmonale), apparent right heart failure, combinations of other diseases, carbon dioxide narcosis and exposure to other inhalants, and sudden death not due to suffocation or heart failure. The patients frequently did not fall into the above classifications. A case of sudden death from bronchial asthma is described along with countermeasures and diagnostic techniques.

52591 **APTIC NO. 74657**

Knelson, John H.

MEDICAL FOUNDATIONS CONCERNING THEE LIMIT VALUE FOR NO2 IMMISSION IN THE U.S.A. *(Medizinische Grundlagen des Grenzwertes fuer NO2-Immissionen in den U.S.A.). Text in German. Staub, Reinhaltung Luft, 35(5):178-184, 1975. 45 refs.*

The medical basis for the U. S. ambient air quality standard for nitrogen oxides are reviewed. Reports which relate an impairment of resistance to human respiratory pathogens to nitrogen dioxide exposure are emphasized. The current NO2 standard of 100 micrograms/cu m should be reasonably protective of public health and appears to contain an adequate safety margin.

52592 **APTIC NO. 76746**

Kodama, Yasushi

STUDY ON THE DIFFERENCE OF ACTIVITY OF BENZO(A)PYRENE-METABOLIZING ENZYME IN DIFFERENT STRAINS OF MICE. *(Benzpyren-taishakoso kassei no sa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(4):717-721, Feb. 1975. 10 refs.*

The activity of benzo(3-4)pyrene hydroxylase in the liver tissue of six different stocks of mice (C37BL/6Ha, C3H/StHa, DBA/2, Ha/ICR Swiss and hybrids of C3H/StHa and C57BL/St) was determined. The activity expressed as the units of supernatant after 15 min of incubation was 477 + or - 15 in males and 485 + or - 27 in females of the C57BL/6Ha strain, 212 + or - 8 in males and 234 + or - 21 in females of the C3H/StHa strain, 165 + or - 7 in males and 284 + or - 4 in females of the DBA/2 strain, 286 + or - 13 in males and 314 + or - 24 in females of the Ha/ICR Swiss strain, 267 + or - 11 in males and 265 + or - 15 in females of the A/St strain, and 198 in hybrid males. The activity of the benzo(3-4)pyrene metabolizing enzyme after 24 hr of intraperitoneal injection showed induction in the C57BL/6Ha, C3H/StHa, and hybrid strains but not in DBA/1, Ha/ICR Swiss, or Alst strains. Administration of olive oil which was used as a solvent for benzo(3-4)pyrene did not affect the enzyme s activity.

52593 **APTIC NO. 74714**

Kosmider, Stanislaw, Mieczyslaw Luciak, and Marian Drozdz

THE INFLUENCE OF AMMONIA ON SOME DISTURBANCES IN PROTEIN CARBOHYDRATE AND LIPID METABOLISM CAUSED BY CHRONIC INTOXICATION WITH COMBUSTION GASES. *Int. Arch. Occup. Health, 35(1):37-59, 1975. 17 refs.*

The possibility of binding sulfur dioxide and nitrogen dioxide in combustion gases by ammonia was investigated. Gaseous ammonia was added to exhausts in stoichiometric proprortions to NO2 and SO2 in order to check whether the toxicity of reaction products was lower than that of the original exhausts. The following determinations were made on control animals and animals exposed to combustion gases and their products with ammonia over a period of 120 days: body weight, morphology of peripheral blood, protein, lipid, and carboxyhydrate content. Post-mortem examinations, including histological and histochemical tests in several tissues, were performed as well. Addition of ammonia to exhausts bound SO2 and nitrogen oxides to a great extent, thus decreasing their toxicity. Exposure of animals to exhausts caused disturbances in protein, carbohydrate, and lipid metabolism. The changes were to a great extent reversed with the addition of ammonia.

52594 **APTIC NO. 74669**

Lindner, Joachim and Hans Zorn

HYDROXYPROLINE IN URINE AS A MEASURE FOR NO2-CAUSED COLLAGEN DAMAGE OF THE RESPIRATORY ORGANS. *(Das Hydroxyprolin im Urin als Mass fuer die NO2-bedingte Kollagenschaedigung der Atmingsorgane). Text in German. Staub, Reinhaltung Luft, 35(5):166-169, 1975. 15 refs.*

The relationship between nitrogen dioxide concentrations in the air and changes in hydroxyproline secretion and other albumin derivatives was determined in a series of experiments with rats. A significant increase in the secretion of hydroxyproline at NO2 concentrations of 2.5 ppm was found, while at an NO2 concentration of 1 ppm, only a tendency toward increased hydroxyproline secretion was observed. At NO2 concentrations of 20 ppm, an increase in creatinine, the final product of creatine catabolism, was found in the urine.

52595 **APTIC NO. 74633**

Loskant, Hans

CAN EXPERIENCES GAINED IN OCCUPATIONAL HYGIENE BE HELPFUL FOR DETERMINING MAXIMUM ALLOWABLE IMMISSION CONCENTRATIONS FOR NITROGEN OXIDES? *(Koennen arbeitsmedizinische Erfahrungen bei der Festlegung von MIK-Werten fuer Stickstoffoxide hilfreich sein)? Text in German. Staub, Reinhaltung Luft, 35(5):165-166, 1975.*

The activities of the VDI-Kommission Reinhaltung der Luft, who are studying the effects of nitrogen oxides on man, are described. For several years, this team has endeavored to deduce maximum permissible ambient air concentrations (MIK values) for nitrogen oxides from the maximum allowable concentration for a place of work (MAK value). Data obtained from medical records of employees exposed to nitrogen oxides (e.g., evaluation of accidents and statistics on the frequency of respiratory diseases) are discussed. Those working in fertilizer production who were exposed to concentrations of nitric acid and oxides of nitrogen approaching the maximum allowable concentration showed no higher rate of respiratory disease than any other group.

52596 **APTIC NO. 74332**

Miyamoto, A.

AIR POLLUTION AND ALLERGY - HIGHER PERCENTAGE OF MORBIDITY OF RESPIRATORY DISEASES ON PEOPLES WITH ALLERGIC DISPOSITION. *(Taikiose [illegible] allergy - soin o motsu hito ni koritsu no kokyuk [illegible] Text in Japanese. Mainichi (Life), 6(6):37-41, June*

The relations [illegible] of air pollution to respiratory disease in allergic or hypersensitive individuals is discussed. Factors discussed in detail include: air pollutants acting as antigens to sensitize the living body, exogenous antigen invasion as affected by air pollution, air pollutant effects on cellular action and antibody production, and air pollutant effects on topical reactivity and allergic reactions. An investigation of factory workers suffering from respiratory diseases revealed that workers with an allergic disposition experienced twice the morbidity rate as workers without such disposition.

52597 **APTIC NO. 74407**

Miyamoto, Y., M. Tak [illegible] H. Narukami, M. Hira, A. Yoshimura, E. Date, [illegible] iyama, and Y. Harada

RESULTS OF INV[illegible]GATION ON ASTHMA IN SCHOOLCHILDREN IN KUMAMOTO CITY. *(Kumamoto-shi gakudo zensoku chosa seiseki). Text in Japanese. Kumamoto Daigaku Taishitsu Igaku Kenkyusho (Bull. Inst. Const. Med., Kumamoto Univ.), 22(1,2), Feb. 1975. 25 refs.*

Although air pollution in Kumamoto, Japan is not as conspicuous as in other industrial cities (average dust fall of 6.18 tons/sq km/mo, sulfur oxide level of 0.025 ppm, and nitrogen dioxide level of 0.024 ppm), an investigation was carried out to assess the state of asthmatic disease in 55,920 primary and secondary schoolchildren in the city. The percentage of suspected primary schoolchildren averaged 5.5% (0 - 8.2%) and showed a higher frequency in the center of the city. The percentage of suspected secondary schoolchildren averaged 2.8% (1.5 - 5.2%). Interviews of the parents of suspected children revealed that the percentage of diagnosed children averaged 2.33% in the city center, 1.33% in the peripheral parts, and 3.46% in a collective housing area. The percentage of children diagnosed with asthma who showed increased peripheral acidocytes was 76.6-85.3% (no local differences). The percentage of positive responses to house dust was 76.6-80.0% (no local differences). The frequency of increased value of serum immunoglobulin E was 56.1-66.2%. The percentage of asthmatic children who had an allergic history was 79.1-88.6% and the frequency of asthmatic children whose families had allergic histories was 62.7-77.1%.

52598 **APTIC NO. 74912**

Miyata, J. and T. Haruta

REPORT OF INVESTIGATION ON PHYSICAL GROWTH OF PRIMARY SCHOOLCHILDREN IN AIR POLLUTED AREAS. *(Taikiosen chiiki no jido shintai hatsuiku ni tsuite no chosa hokoku). Text in Japanese. Ikuyukai Kogai Kennkyusho Shoho (Rep. Ikuyukai Inst. of Environ. Pollut.), no. 10:1-31, March 1975. 5 refs.*

The physical growth of primary schoolchildren in air polluted areas was compared to that of children in non-polluted areas of Kawasaki, Japan. Physical growth was assessed using the following personal health examination data: average and standard deviation of height, weight, and girth of chest; their distribution; average yearly increase and standard deviation of rate of height, weight and girth; its distribution; and the distribution of Rohrer s index and visual acuity by school and by class. No difference in body height was seen; the standard deviation of the average value was larger, however, in air polluted area. The average increase was also larger in the air polluted area. The average chest girth and body weight were larger in the polluted area. The average increase in these was also larger in the polluted area. Boys with a higher Rohrer s index were more numerous in the polluted area, and girls with a higher Rohrer s index were more numerous in the unpolluted area. Children with visual disturbances were more numerous in the polluted area.

52599 **APTIC NO. 74428**

Mori, A.

ACTUAL STATE OF MEDICAL TREATMENT ON OFFICIALLY RECOGNIZED PATIENTS DUE TO ENVIRONMENTAL POLLUTION, A HISTORY IN A MEDICAL CENTER DURING THE PAST ONE YEAR. *(Kako I nenkan ni okeru toshin kogibyo ninteikanja no iryo no jittai). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 35:82, Feb. 1975.*

Records of a medical center located in the center of a southern coastal industrial zone of Japan where air pollution is the same as that in Yokkaichi, Kawasaki, and Amagasaki are reviewed. Among 18,238 patients who visited the center, 456 were officially recognized as air pollution patients. About 43.8% of the patients were from outside the jurisdiction. Asthmatic bronchitis was frequent in babies and the elderly. The number of (recognized patients showed two peaks, June and October to March, which coincided with the monthly variation of air pollution. Almost all of the recognized patients showed slight or moderate symptoms. Among nine mortalities, three cases were due to lung cancer, suggesting the necessity of examining the role of carcinogenic substances in air pollution.

52600 **APTIC NO. 74677**

Nagano, J.

AIR POLLUTION AND EXAMINATION OF LUNG FUNCTION. *(Taiki-osen to hai kinokensa). Text in Japanese. Kokyu to Junkan (Respiration and Circulation), 23(5):396, May 1975.*

The diagnosis of chronic obstructive lung disease caused by air pollution was performed based on lung function tests. Such diseases can also be caused by other factors. Patterns specific to air pollution were investigated along with quantitative relationships to air pollutants. Nitrogen dioxide and ozone reach the peripheral airway and it is necessary to detect minute early changes.

52601 **APTIC NO. 74796**

Nagata, I., H. Asami, H. Otani, H. Isomura, S. Ono, S. Kido, A. Nagashima, H. Inoue, K. Takashima, H. Ota, H. Onda, H. Kodama, N. Yamada, S. Maeno, and H. Nakao

ENVIRONMENTAL POLLUTION AND RESPONSE OF LIVING THINGS. PART 2. INFLUENCE OF DUST ON LIVING BODIES. *(Kankyoosen to seitaihanno. Part 2. Baijin no seitai ni oyobosu eikyo). Text in Japanese. Juichikusan Shinpo (J. Vet. Med.), no. 639:535-541, May 1975. 4 refs.*

The health effects of dust from electric furnaces on inhabitants in Kariya and in Anjo, Japan were investigated. Personal interviews, medical examinations, lung function tests, and chest roentgenography revealed the existence of a small number of respiratory complaints and disturbance of lung function; however, the data were in the range of normal values, indicating no adverse effects of dust on lung function. The accumulation of lead in inhabitants was very low, reflecting the effect of improvements in dust-collecting equipment in the factories with electric furnaces.

52602 **APTIC NO. 74344**

Nakajima, Y.

PHOTOCHEMICAL SMOG AND CLINICAL EXPERIENCE ON THE INJURIES DUE TO IT. *(Kokagaku smog to higai no rinsho). Text in Japanese. Nihon Jibi Inkoka Gakkai Kaiho (Jap. J. Otorhinolaryngolog. Soc.), 78(3):77, March 1975.*

The frequency of occurrence of photochemical smog in Japan is increasing, and more than 300 smog alarms and 30,000 pollution victims were reported in 1973 for 21 prefectures. The causal substance are about the same as those in Los Angeles smog, except for a few recently identified new substances. Symptoms observed in hospitalized patients were eye irritation; upper and lower airway and pulmonary mucosa irritation; peripheral nerve disturbances such as headache, dizziness, and those of the glove and sock type; and central nervous system disturbances, including spasm, disturbance of consciousness, general numbness, nausea, coldness, and pyrexia. In many cases, increases of blood corpuscles and neutrocytes, differences of partial gas pressure between alveolar air and arterial blood, decreases off lymphocytes and oxygen partial pressure in arterial blood, and peripheral airway constriction were observed. Personal differences were related to susceptibility. Chronic effects of photochemical smog were also evaluated based on the results of animal experiments.

52603 **APTIC NO. 74771**

Nakashima, H.

CARCINOGENIC SUBSTANCE, CHLOROPRENE - DANGEROUS CIRCUMSTANCES IN SYNTHETIC RUBBER FACTORY. *(Hatsugan busshitsu, chloroprene - gosei gomu koji no kiken na kankyo). Text in Japanese. Gijutsu to Ningen (Tech. Hum. Being), 4(5):81-85, March 1975.*

The carcinogenicity of the polymer neoprene (polychloroprene) is discussed. According to Russian research, 137 skin cancer patients were found among 24,989 workers in Albania between 1956 and 1970. Of these, 59 were employees at chloroprene factories. The allowable concentration of chloroprene is 25 ppm or 90 mg/cu m according to the American Conference of Governmental Industrial Hygienists. The synthetic rubber production of Russia is estimated to be about 1.5 million tons annually. However, the amount of chloroprene rubber production is not known. In Japan, 74,000 tons of neoprene rubber are produced annually. The carcinogenic acitivity of vinyl chloride was demonstrated in January of 1974, but the findings were ignored by industry in Japan. In Sweden, operations which produce vinyl chloride monomer were interrupted. The production capacity of vinyl chloride monomer totals 2.04 million tons annually in Japan.

52604 **APTIC NO. 74670**

Nieding, Giselher von and H. Michael Wagner

COMPARISON OF THE EFFECT OF NITROGEN DIOXIDE AND NITRIC OXIDE ON HUMAN RESPIRATORY FUNCTION. *(Vergleich der Wirkung von Stickstoffdioxid und Sticksoffmonoxid auf die Lungenfunktion des Menschen). Text in German. Staub, Reinhaltung Luft, 35(5):175-178, 1975. 6 refs.*

In 298 healthy subjects and in 132 patients with respiratory diseases between 18 and 72 years of age, the effects of nitrogen dioxide and nitric oxide on respiratory gas exchange and breathing mechanisms were investigated. After inhalation of 5 ppm NO2 or more than 15.0 ppm NO in a 15-minute period there was a significant decrease in arterial oxygen partial pressure. The diffusion capacity for carbon monoxide decreased significantly after a 15-minute exposure to 5 ppm NO2. This did not occur with NO, even at concentrations of up to 39 ppm. Airway resistance increased significantly after inhalation of NO2 at concentrations of 1.6-2.0 ppm or of NO at levels above 20 ppm.

52605 **APTIC NO. 74927**

Oda, Hajime, Shigeko Kusumoto, and Taichi Nakajima

A DIFFERENCE IN THE FORMATION OF NITROSYL-HEMOGLOBIN AMONG MAMMALIAN SPECIES. *(Issanka-chisso-hemoglobin seisei no shuzoku- sa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(4):714-716, Feb. 1975. 6 refs.*

Nitrosyl-hemoblogin (NO-Hb) was detected by electron spin resonance spectrometry in blood collected from the orbital venous plexus of female mice (JCL-ICR strain) and rats just after exposure to 6.6 ppm nitric oxide and 0.5 ppm nitrogen dioxide for 1 hr. It was not detected in blood collected from the auricular vein of rabbits exposed to the same dose, and it was only detected after reduction of the blood by sodium dithionate. No difference was observed between the affinities of both animals hemoglobin to nitric oxide in experiments using hemolyzed blood and sodium nitrite in the presence of sodium dithionate. The oxygen affinity and the degree of oxygen saturation of rabbits blood collected from the auricular vein were higher than those of mouse blood collected from the orbital venous plexus. Another experiment showed that there is a species difference in the activity of intraerythrocytic reducing enzyme. These two factors explain the species difference in the formation of nitrosyl-hemoglobin between mice and rabbits after exposure to nitric oxide.

52606 **APTIC NO. 74732**

Otsu, Hiroshi and Genshiro Ide

EFFECT OF NITROGEN DIOXIDE ON TUMORIGENESIS IN THE LUNG OF MICE ADMINISTERED 4-NITROQUINOLINE-1-OXIDE. *(4-Nitroquinoline-1-oxide toyo mouse hai-shuyo hassei ni oyobosu NO2 gas no eikyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(4):702-707, Feb. 1975. 23 refs.*

Young (1 month-old) mice of strain A were divided into 4 groups, I, II, III, and IV. Mice of group I and II (each consisting of 13 animals) were each given 0.25 mg of 4-nitroquinoline-1-oxide dissolved in 0.1 ml of a mixture of olive oil and cholesterol (100:5). Mice of groups I and III (consisting of 26 animals) were exposed dioxide at 10 + or -2 ppm, 2 hr/day, 5 days/wk for 50 wk. On autopsy it was found that the incidence of lung tumor was, respectively, 6/13, 9/13, 3/26, and 4/50 for groups I, II, III, and IV (group IV was the control). The morphology of the tumors was differentiated into two groups according to the administration of 4NQO. Exposure to nitrogen dioxide showed a tendency of decreasing the tumorigenesis in the lungs of mice administered 4NQO. Nitrogen dioxide exposure appeared to induce a proliferation of peripheral bronchiolar epithelial cells; however, it did not appear to induce lung tumors. In groups administered 4NQO, the lung tumor growth was stronger in atypia. In groups exposed to nitrogen dioxide, a pulmonary emphysematic change was observed in parts of the lung without tumors.

52607 **APTIC NO. 74535**

Rouskova, Valja

PHOTIC STIMULATION IN EARLY DIAGNOSIS OF THE EFFECTS OF SOME HARMFUL INDUSTRIAL SUBSTANCES ON THE CENTRAL NERVOUS SYSTEM. *Int. Arch. Arbeitsmed., 34(4):283-299, 1975. 10 refs. (Presented at the Czechoslovak Congress of Neurology, Prague, Sept. 1972.)*

The responses to photic stimulation (P.S.) were analyzed in the electroencephalograms (EEG) of 114 workers. Sixty-seven experienced long-term, intense exposure to carbon disulfide, 27 were exposed to mercury, and 20 to trichloroethane and toluene. The results were compared with thee responses of 20 controls. The P.S. responses of workers exposed to mercury ranged from high to low frequencies (63%). The P.S. response of workers in the CS2 environment was reduced (40.3% of the cases studied), or completely absent (41.8%). The workers in the solvent-hazard environment showed either low P.S. frequencies (35%) or had culmination points in the theta and beta bands (55%). In persons exposed to mercury and solvents, a changed P.S. response was an early symptom, as it occurred in persons with no clinical symptoms and in those with no change in the original EEG. Photic stimulation is a sensitive method for preventive health care of workers exposed to harmful industrial substances.

52608 **APTIC NO. 74728**

Sebayashi, Tutae and Kosaku Ozaki

HEALTH DISTURBANCE OF SCHOOLCHILDREN DUE TO PHOTOCHEMICAL SMOG AND AIR POLLUTANTS. *(Kokagaku smog ni yoru gakudo no kenkoshogai to taikiosen busshitsu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(8):881-886, Aug. 1975. 18 refs.*

The relationship between photochemical smog pollution and respiratory function during exercise was investigated in schoolchildren living in Kobe, Japan. Those children who complained of sore throat during exercise were children whose physiological functions had not fully developed, children who had a disease history, or children with abnormal respiratory functions. Human injury due to photochemical smog varied among individuals, depending on several factors.

52609 **APTIC NO. 74578**

Sheppard, Roy J., Hugues Lavallee, Georges Lariviere, Mirjana Rajic, Guy-R. Birsson, Claude Beaucage, Jean-Claude Jequier, and Robert La Barre

THE PHYSICAL CAPACITY OF CANADIAN CHILDREN: A COMPARSION OF CHILDREN OF FRENCH, BRITISH, AND ESKIMO DESCENT. *(La capacite physique des enfants canadiens: une comparaison entre les enfants canadiens-francais, canadiens-anglais et esquimaux). Text in French. Union Med. Canada, 104(2):259-269, Feb. 1975. 20 refs.*

Results of comparative anthropometric, muscular and pulmonary function tests conducted among rural and urban children (ages 9-12 yr) of French, British, and Eskimo descent are presented. French Canadian children were found to be smaller than those of Anglo-Saxon origin; this may be due to genetic, environmental, socio-economic, and nutritional factors. There was no significant difference between urban and rural French Canadian children in terms of vital capacity and forced vital capacity. The carboxyhemoglobin levels were 0.53 + or - 0.16% in urban boys, 0.47 + or - 0.17% in urban girls 0.70 + or - 0.12% in rural boys and 0.72 + or - 0.1% in rural girls, as compared to 1.12 + or - 0.48% in boys and 1.09 + or - 0.29% in girls in Toronto. The substantially higher COHb levels in the rural children were due to a 1-hour automobile drive to the laboratory.

52610 **APTIC NO. 74458**

Shimizu, Tadahike, Yoshigo Tsunetoshi, Hiroshi Kono, and Shoichi Shimmura

CLASSIFICATION OF SUBJECTIVE SYMPTOMS OF JUNIOR HIGH SCHOOL CHILDREN AFFECTED BY PHOTOCHEMICAL SMOG. *(Kokagaku smog ni yoru (chugakko seito no) jikaku shojo no bunrui). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(4):734-741, Feb. 1975. 11 refs.*

Junior high school students affected by photochemical smog were classified according to their subjective symptoms. Eye irritation, cough and sore throat, nausea, dizziness, and numbness in the extremity were predominant. In one school the percentage of complaints increased with increased physical activity, and the symptoms changed from eye irritation to cough and sore throat as well as nausea and nervous disorders. Sexual differences were observed, with complaints being expecially frequent in girls.

52611 **APTIC NO. 74298**

Takayama, Otohiko

CHARACTERISTICS OF THE UPPER RESPIRATORY TRACT ASSOCIATED WITH POLLUTION AND INFECTION. *(Kidokei ni okeru kansen to osen tono kanrensei -tokuni jokido ni okeru osen to kansen no tokucho). Text in Japanese. Nihon Kikan-Shokudoka Gakkai Kaiho (J. Japan Broncho-Esphagolog. Soc.), 26(2):68-73, 1975. 12 refs.*

Histological and epidemiological findings concerning the effect of air pollution and infection on the upper respiratory tract are reported based on experiments with rabbits exposed to ozone and on observations of photochemical smog victims. Lymph follicles on the pharyngeal posterior wall react to air pollution and to infection in about the same way. Laryngeal and tracheal cilia are deformed by air pollutants, with the deformation by ozone becoming more conspicuous with time. Air pollution aggravates symptoms in patients with infectious diseases and allergies.

52612 **APTIC NO. 74679**

Takeuchi, J., K. Hayashi, and S. Nakagaki

AN AUTOPSY CASE OF ADENOID CYSTIC CARCINOMA WHICH HAD BEEN DIAGNOSED CLINICALLY AS BRONCHIAL ASTHMA. *(Rinshoteki ni kikanshi zensoku to omowareta senyo noho gan no ichirei). Text in Japanese. Gendai Igaku (Curr. Med.), 22(3):319-322, March 1975. 7 refs.*

A female patient (age 65 yr) who lived in an air polluted area of Yokkaichi and who showed asthmatic symptoms seemingly due to air pollution showed upon autopsy adenoid cystic carcinoma which proliferated to block the bronchus and projected into the bronchial cavity near the bifurcated part. The histopathological findings are described in detail. There was no anatomical sign of bronchial asthma or bronchitis. Examinations for lung tumorigenesis in inhabitants of Yokkaichi exposed to air pollution for more than 10 yr are suggested.

52613 **APTIC NO. 74920**

Tsunetoshi, Yashigo

EPIDEMIOLOGICAL STUDY OF RESPIRATORY DISEASES CAUSED BY ENVIRONMENTAL AIR POLLUTION. *(Kankyo osen ni yoru kidokei shikkan no ekigaku). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan. Broncho-Esophagolog. Soc.), 26(2):56-61, 1975. 6 refs.*

An epidemiological study of the relationship of chronic bronchitis to air pollution was carried out on 36,374 inhabitants of Osaka and Hyogo Prefectures who were older than 40 yr and who live in areas with different degrees of air pollution. Some persons were given chest roentgenographs and respiratory function examinations. Age, smoking, and air pollution clearly affected morbidity due to chronic bronchitis; and, after normalizing age and smoking, the morbidity was a function of the airborne concentration of sulfur dioxide. Furthermore, the effects of age, smoking, and air pollution were additive. An epidemiological investigation of 39,834 schoolchildren concerning asthma and asthmatic bronchitis showed that morbidity due to asthmatic bronchitis was higher in children in more highly polluted areas. The percentage of recovery from the disease was lower and the percentage of aggravation of the disease was higher in more highly air polluted areas.

52614 **APTIC NO. 74482**

Tusl, Miloslav, A. Vyskocil, and V. Sesinova

CHANGES OF PLASM CORTICOSTERONE IN RATS AFTER INHALATION OF OXIDES OF NITROGEN. *(Veraenderungen im Plasma-Corticosteron bei Ratten nach Inhalation von Stickstoffoxiden). Text in German. Staub, Reinhaltung Luft, 35(5):210-211, May 1975. 4 refs.*

Male rats with an average weight of 250 g were exposed to nitrogen dioxide concentrations ranging from 20 to 115 ppm. The exposure chamber permitted decapitation within 10 sec. A 2-hour exposure to concentrations from 40 ppm onward triggered the production of a higher quantity of corticosterone until a certain plateau level was reached at which the corticosterone quantity did not rise any further with increases in the NO2 concentration. The organism adapted to the repeated exposure, and the adaption time depended on the gas concentration. At 45 ppm NO2, it took 19 days to adapt; at 30 ppm, 5 days.

52615 **APTIC NO. 74678**

Umeda, H.

AIR POLLUTION AND ASTHMA. *(Taikiosen to zensoku). Text in Japanese. Kurashi to Kenko (Life Health), 30(5):50-51, May 1975.*

Nonspecific stimulants such as automobile exhaust, tobacco smoke, and chimney effluents appear to cause constriction of bronchial unstriated muscle, accentuation of secretion from the bronchial mucosa, and cough and dyspnea in persons with airway hypersensitivity. Sulfur dioxide, nitrogen dioxide, and ozone are suspected to change the airway hypersensitivity itself. Symptoms of asthma are aggravated by air pollution; air pollutants themselves, however, do not appear to cause asthma in persons without a predisposition for asthma. Guinea pigs exposed to oxidants showed a higher mortality due to experimental asthma than animals not exposed when both groups were made to inhale acetylcholine. There are no epidemiological data which indicate the accentuation of airway hypersensitivity in the persons who live in air polluted areas for long periods.

52616 **APTIC NO. 74640**

Veninga, Tjeerd and Willy Lemstra

EXTRAPULMONARY EFFECTS OF OZONE WHETHER IN PRESENCE OF NITROGEN DIOXIDE OR NOT. *Int. Arch. Arbeitsmed., 34(3):209-220, 1975. 29 refs.*

Exposure of mice to 0.2 ppm ozone for 2 hr induced increments in plasma GPT, in liver ascorbic acid, and in the number of binuclear lymphocytes in peripheral blood. The effects were most marked 2 hr following exposure. The addition of nitrogen dioxide did not influence the ozone effect on the liver ascorbic acid level. Nitrogen dioxide also caused an increase in liver ascorbic acid. These effects were due to mobilization of an oxidant-reducing system, rather than by tissue injury alone.

52617 **APTIC NO. 74719**

Wakasa, Katsutaro

REGIONAL MEDICAL ASSOCIATIONS AND ENVIRONMENTAL HEALTH. *(Chiku ishikai to kankyo hoken). Text in Japanese. Koshu Eisei (Public Health), 39(3):140-144, March 1975.*

The activities of regional medical associations in the field of environmental health are described. Medical associations have cooperated with regional authorities in conducting research surveys on air pollution. The Tokyo Metropolitan Health Bureau operates in three areas: medical examinations, research surveys, and clinics. Medical examinations are conducted for air pollution-caused syndromes (especially chronic respiratory diseases) and for specific syndromes (such as those resulting from heavy-metal soil pollution near chemical factories). Types of research surveys include: long-term surveys on respiratory tract infections and effects of lead and cadmium; photochemical smog effect surveys; polychlorinated biphenol effects in human milk and fatty tissue, the atmosphere, and food; accumulation of metals in the body; toxicity and the residual nature of neutral washing agents; life environment surveys as related to air pollution; basic surveys on health damage (respiratory illnesses). Medical students about to finish their schooling have treated victims of respiratory track infections as part of the subsidization of medical costs for the patients. The medical association has suggested simplification and standardization of pollution compensation procedures. The Tokyo Metropolitan Medical Association has established a section for environmental pollution countermeasures.

52618 **APTIC NO. 74508**

Watanabe, Hiromu, Hirokazu Shimouchi, and Tsuguo Matsumoto

ON THE VIEWPOINT OF NORMAL BACTERIAL FLORA IN THE RESPIRATORY SYSTEM IN CONNECTION WITH AIR POLLUTION. *(Kokyuki-kei jozai saikinso no kangaekata). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(4):708-713, Feb. 1975. 12 refs.*

Experimental results indicating a synergistic action between air pollutants, such as nitrogen oxide and ozone, and microorganism in upper airways are discussed. Changes in the balance of microbiol flora during environmental stress can reduce the infection-protecting mechanism of the organism. The cognizance of such changes is especially important when assessing the health effects due to air pollution exposure.

52619 **APTIC NO. 74676**

Yoshida, E., T. Kubota, A. Kanayama, and Y. Nakai

EFFECT OF AIR POLLUTION ON VIRAL INFECTION IN RESPIRATORY SYSTEM. *(Kokyuki-kei virus kansen ni oyobosu taiki-osen no eikyo ni tsuite). Text in Japanese. Shizuoka-ken Eisei Kenkyujo Hokoku (Bull. Shizuoka Prefect. Inst. Pub. Health), no. 18:37-42, 1975. 22 refs.*

The effect of air pollution on viral infection of the respiratory system was investigated in about 30 adults and 20 children in air polluted areas of Fuji and Fujinomiya and in a non-polluted area of Fujieda by isolating and identifying the virus in pharyngeal washings, and surveying concentrations of sulfur oxides and suspended particulates. A significant difference in sulfur oxide concentration was observed between the two areas; no significant difference existed for suspended particulates. No virus was detected in healthy adults from either area. The frequency of viruses in children patients with airway diseases was not higher in the air polluted areas.

52620 **APTIC NO. 74702**

Zielhuis, R. L.

DOSE-RESPONSE RELATIONSHIPS FOR INORGANIC LEAD. II. SUBJECTIVE AND FUNCTIONAL RESPONSES - CHRONIC SEQUELAE - NO-RESPONSE LEVELS. *Int. Arch. Occup. Health, 35(1):19-35, 1975. 39 refs.*

Lead-in-blood levels (PbB) were regarded as internal dose. It was not possible to suggest adequate dose-response relationships. However, various no-response levels were suggested. The concept of no-response level and dose-response relationships was re-evaluated. The dose-reponse relationships as presented indicated that for a population group with the distribution of PbB s indicated in the Biological Quality Guide, only a limited number of individuals might already show a slight decrease of protoporphyrin in erythrocytes, because in such a population 98% of the subjects have a PbB of less than 35 micrograms/100 ml; and 50% a PbB greater than 20 micrograms/100 ml.

52621 **APTIC NO. 74720**

Zielhuis, R. L.

DOSE-RESPONSE RELATIONSHIPS FOR INORGANIC LEAD. I. BIOCHEMICAL AND HAEMATOLOGICAL RESPONSES. *(Int. Arch. Occup. Health, 35(1):1-18, 1975. 48 refs.*

Literature on the relationship between lead-in-blood levels (PbB) and various biochemical and hematological responses are reviewed. PbB levels were considered representative of internal dose. The percentage of subjects with a specified intensity of a specified reponse in groups of subjects was calculated in relation to PbB. This Dose-Reponse (D-R) relationship showed an increase of biological effects with increasing internal dose, qualitatively and quantitatively, and can be used to evaluate the significance of Pb exposure in occupational and public health. D-R curves were calculated for delta-aminolevulinic acid dehydratase activity in erythrocytes, delta-aminolevulinic acid excretion in urine, protoporphyrin in erythrocytes, sodium, ion, potassium ion, and ATPase activity in erythrocytes, and reduced glutathion content of erythrocytes. Other biochemical and hematological reponses are discussed with regard to their relationship with PbB.

52622 **APTIC NO. 76649**

Zorn, Hans

THE ALVEOLAR ARTERIAL OXYGEN PRESSURE DIFFERENCE AND THE OXYGEN PARTIAL PRESSURE IN TISSUE FOLLOWING NO2 EXPOSURE. *(Die alveolo-arterielle Sauerstoffspannungsdifferenz und der Gewebe-Sauerstoffpartialdruck bei NO2-Belastung). Text in German. Staub, Reinhaltung Luft, 35(5):170-175, 1975. 28 refs.*

Nitrogen dioxide and nitric oxide-nitrogen dioxide mixtures with air produced a change in pulmonary function and oxygen uptake by the blood. Several hours after exposure to increased concentrations of NO2 and the nitric oxide-nitrogen dioxide mixture, the oxygen uptake was impaired for some time. The relationship between the dose and the effect of 0.5 to 20 ppm NO2 on various pulmonary parameters and oxygen partial pressure in the brains of various animal species was determined and compared with altitude hypoxia. The synergistic hypoxic effect of carbon monoxide and NO2 was demonstrated. It was shown that a lack of oxygen as caused by 1 ppm NO2 immediately or during the first two days corresponds to the lack of oxygen at an altitude of 700 m. In all the animal experiments, diseases of the respiratory tract were not more frequent among the exposed animals than among the control group.

52623 **APTIC NO. 74673**

Saitama Prefectural Office (Japan), Health Service Section

STATUS OF HEALTH DISTURBANCE DUE TO PHOTOCHEMICAL SMOG IN PUBLIC SCHOOLS AND ITS COUNTERMEASURE. *(Koritsugakko ni okeru kokagaku smog no kenko shogai no jokyo to taisaku). Text in Japanese. In: Development and Countermeasures of Occurrence of Photochemical Public Nuisance in Saitama Prefecture, p. 50-55, March 1975.*

Health statistics for photochemical smog injuries to schoolchildren in Saitama Prefecture are reported. Injured pupils in public schools numbered 1220, 2540, 5065, 5321, and 1356, respectively, in 1970, 1971, 1972, 1973, and 1974. In 1974, there were 383 injuries in primary school, 944 in middle school, and 29 in high school. The percentages were 41 and 59 for boys and girls, respectively, in primary school and 61 and 39 for boys and girls, respectively, in middle school. The frequency of injury due to photochemical smog was highest when photochemical smog alarms were issued and between the hours of 11 am and 1 pm. Subjective symptoms when arranged according to frequency were: eye irritation, pain in the pharynx, cough, headache, dyspnea, and nausea. No case required hospitalization. Oxidant concentrations were occasionally over 0.15 ppm for short periods with the peak time being delayed as the air pollution became greater.

52624 **APTIC NO. 74675**

Saitama Prefectural Office (Japan), Section of Health and Disease Prevention

STATE OF NOTIFICATION OF INJURY DUE TO PHOTOCHEMICAL SMOG. *(Kenko higai tododede jokyo). Text in Japanese. In: Development and Countermeasures of Occurrence of Photochemical Public Nuisance in Saitama Prefecture, p. 25-39, March 1975.*

Health injury due to photochemical smog in 1974 began on May 17 and ended on September 9 in Saitama Prefecture. There were 16 days when injury occurred, with the number of notifications being 1498. Among the notifications, 63.1% were middle schoolchildren and 5% were from the general populace. The complaints consisted of eye and throat pain, headache, cough, dyspnea, lachrymation, and light nausea. A very small number of people complained of nosebleeds and showed convulsions. The towns and villages where the notifications were issued were located in the middle to south region of the prefecture.

52625 **APTIC NO. 74691**

EFFECTS ON LIVING THINGS OF COMPOUNDED AIR POLLUTANTS. PART 1. STUDIES ON THE EFFECTS OF COMPOUNDED AIR POLLUTANTS ON LIVING THINGS, BY DIVISION OF OCCUPATIONAL HEALTH, NATIONAL INSTITUTE PUBLIC HEALTH DURING 1972-1975. *(Seitai ni taisuru eikyo kankei. 1. Taiki fukugo-osen busshitu ga seitai ni oyobosu eikyo). Text in Japanese. PPM (Japan), 6(8):84-86, Aug. 1975.*

Animal experiments involving the effect of ozone and other pollutants on lung function are discussed in terms of such factors as age, organism resistance, and other variables affecting the lung. The object of the studies was to supply fundamental data required for lung function tests during epidemiological investigations. By acutely exposing rats to ozone, the dose-response for ozone, the difference of response due to age, and the acquisition of resistance to ozone were recognized. Chronic exposure of rats to ozone also yielded some information. Compound exposure to ozone and aerosols as well as exposure to sulfuric acid mist is now being investigated.

52626 **APTIC NO. 74921**

Environment Agency (Japan), Health Service Dept.

SUMMARY OF SURVEY ON CANDIDATE DISTRICTS OFFICIALLY TO BE APPOINTED AS UNHEALTHY AREAS. *(Kenko higai chiiki shitei chosa kekka no matome). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(8):953-954, Aug. 1975.*

The results of a survey of air pollution and health effects in areas officially appointed as areas where environmental factors are injurious to human beings are presented in tabular form. The appointed areas include: three areas in Chiba, 13 wards of Tokyo, three areas in Kawasaki, a town in Mie Prefecture, 10 wards of Osaka, three areas in Suita, and two sections of Amagasaki. There were 31 areas where air pollution was conspicuous and 27 areas where health injury occurred frequently. There were 27 areas that were newly appointed as areas where there are environmental factors injurious to human health.

1974

52627 **APTIC NO. 74383**

Anzai, Hiroshi, Takehiro Sakaguchi, Takanori Wada, Yukiji Yoshifuku, Fumio Kawaguchi, Keiko Tone, and Yasuo Hoshino

EFFECT OF HEAVY METALS ON LIVING BODIES. I. EFFECTS OF PB AND ZN ON CELLS. *(Jukinzoku no seitai ni oyobosu eikyo. I. Pb oyobi Zn no saibo ni taisuru sayo ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 21(10):364, 1974. (Presented at the Japanese Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 478.)*

The effects of lead and zinc on cells were investigated by studying reproductive and pathogenic capacities of two strains of dysentery bacilli (Shigetta flexneri 2b(17-A) and Shigella flexneri 2b(17-N)). Metal-pretreated bacterial solutions were formed by addition of bacilli to aseptic aqueous solutions of Pb(C2H5)3Cl and standard zinc solution (for atomic spectra use). Solutions were allowed to stand at 37 C for 2 hours, and used after repeated centrifugation, washing, and removal of metallic compounds. Reproductive capacities of pretreated bacilli were followed by taking turbidity measurements (590 nm) in bacilli-innoculated hydrogen iodide broth, containing metal (5 ppm), for 8 hrs at 37 C. The presence of Pb in the broth inhibited reproduction, and the combined presence of Pb and Zn (including Zn from pretreatment) inhibited reproduction still further. Lead pretreatment plus presence of Zn in the broth gave results similar to control results, i.e., no inhibition. Pathogenic capacities were studied by investigation of permeation in cell cultures, and formation of corneal and conjunctival inflammations in eyes of guinea pigs. Pretreated bacilli were added to HeLa cells cultured in YLE medium for 48 hr. At intervals, 400 cells were counted for infection frequency. At the end of 8 hr, about 100% permeation occurred with control and Zn-treated (20 ppm) bacilli, although the increase in rate of infection was slower for the latter. For bacilli treated with Pb (20 ppm) and Pb-Zn (10 ppm each), about 40% infection rate was present at the end of 8 hr. In studies on corneal and conjunctival inflammations, solutions of pretreated bacilli (5 mg/ml) were put in the eyes of guinea pigs, and the course of infection was followed for 2 weeks. Zinc-treated bacilli were dormant. Some infection was observed for Pb-treated bacilli. Results were the same for Pb-Zn treated bacilli and control bacilli; bloodshot and rheumy eyes occurred the day after eye contact with bacilli drops, and inflammation increased thereafter.

52628 **APTIC NO. 74311**

Asmangulyan, A. A., N. G. Ivanov, and A. V. Tutnova

THE EFFECT OF SULFUR DIOXIDE ON THE GASTRIC FUNCTION IN ALBINO RATS. *(Vliyanie sernistogo angidrida na funktsiyu zheludka belykh krys). Text in Russian. Izv. Akad. Arm. SSR, Zh. Eksper. Klin. Med., 14(2):15-19, 1974. 18 refs.*

The effect of sulfur dioxide on gastric function was studied by acute and chronic inhalation tests on albino rats. Single inhalations of concentrations ranging from 10 to 740 mg/cu m caused no change in the secretory and motor evacuation functions of the stomach. Reduction of the neuromuscular excitability was observed at concentrations over 500 mg/cu m. Chronic inhalation of SO_2 in concentrations of 10.4-50.8 mg/cu m for 15, 30, or 120 days reduced the acid mucopolysaccharide levels in the gastric mucosa. Pathomorphological examinations revealed lymphocyte eosinophil and leukocyte infiltration of the gastric mucosa, erosion of the gastric mucosa, and dilation of the lymphatic vessels in the duodenum.

52629 **APTIC NO. 74612**

Chovin, P.

THE PATHOLOGICAL SIGNIFICANCE OF GASEOUS AUTOMOTIVE EMISSIONS. *(Role pathologique des polluants gazeus de la automobile). Text in French. Congr. Natl. Tuberc. Mal. Respir., 17th, Clermont- Ferrand, France, 1974, p. 197-206, 1974.*

Health hazards of exposure to the gaseous components of automotive exhaust, namely carbon monoxide, light hydrocarbons, and nitrogen oxides are reviewed. Carbon monoxide, combining with hemoglobin in the blood, causes reduction of the oxygen pressure, insufficient blood supply for the tissues and organs, cholesterol enrichment in the aortic wall which may lead to arteriosclerosis, increased arterial pressure, and increased protein level in the plasma. The central nervous system is most susceptible to CO which causes impairment of mental functions. While the lightweight hydrocarbons emitted as gasoline vapor or unburnt residues are not hazardous in the concentrations encountered in automotive exhaust, in the presence of nitrogen oxides and intense solar radiation they create highly irritative photochemical smog. In mice exposed to 0.5 ppm nitrogen dioxide for several months, serious pneumonia and erosion of the bronchial epithelium were observed. The NO_2 may also accelerate the carcinogenic activity of other substances by promoting the production of nitrosamines in vivo.

52630 **APTIC NO. 74629**

Delcanu, M. and N. Moldovan

MORBIDITY ASPECTS IN THE POPULATION OF AN INDUSTRIAL CENTER, RELATED TO URBAN ATMOSPHERIC POLLUTION. *(Aspecte ale morbiditatii populatiei dintr-un oras cu industrie de materiale refractare, lemnoase si celuloza, in raport cu poluarea bazinului atmosferic urban). Text in Romanian. Clujul Med., 47(3):351-355, 1974. 4 refs.*

The incidence of certain diseases in the population of an industrial center was studied over a period of 9 yr as was compared to three urban centers which do not have intensely polluted atmospheres. The latter were Alba Iulia, Miercurea Ciuc, and Zalau. The incidence of the diseases was studied in infants, children, and adults (1000 from each city). The arithmetic mean of the annual frequencies was calculated over the 9 yr period. The intensity of the risk factor index showed how many times higher the disease incidence in the industrial center was as compared to the three urban centers. The diseases considered were those of the respiratory, cardiovascular, and digestive systems. The incidence of disease in the industrial center was one and a half times higher in children and two times higher in adults than in the three urban centers. The highest frequencies were for adeno-tonsilitis hypertrophies, chronic bronchitis, and severe bronchitis in children and coronary arteriopathy, degenerative myocarditis, hypertension, and chronic bronchitis in adults.

52631 **APTIC NO. 74410**

Fujii, Toru

STUDIES ON TRACE ELEMENTS CONTAINED IN ORGANS (2). *(Zoki soshikichu biryo genso no ganyuryo ni kansuru kenkyu (2)). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10):353, Oct. 1974. (Presented at the Japanese Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 467.)*

Eighteen trace elements were found in human blood vessels, body organs, and sternum, by means of emission spectrometry. Autopsies were performed on 32 cases (22 males, 10 females), ranging in age from 19 to 88, from Osaka Prefecture, Japan. Organs weighed from 10-20 g. To organs originally weighing less than 10 g, graphite was added after low-temperature ashing of the organ, in 1:1 ratio to the ash. No sexual variations in element content were discernable. Variations in element content with respect to age were as follows (numbers in ( ) are micrograms/g of ash): lungs: aluminum (1350) and silicon (960) increase with age; high cadmium content was found in the 30 s and 50 s; heart: Cd (13), copper (265), and zinc (225) concentrations increase with age; spleen: high boron concentrations occur in the 30s and 40 s; Cd content (110) decreases with age; liver: tin (11.5) reaches a high in ages over 40; cerebrum: Cu (250) increases with age; kidneys: Al (114.5) and Si (215) increase with age. The amounts of other elements showed no particular trends with age.

52632 **APTIC NO. 76694**

Jaksch, John A. and Herbert H. Stoevener

OUTPATIENT MEDICAL COSTS RELATED TO AIR POLLUTION IN THE PORTLAND, OREGON AREA. *Oregon State Univ., Corvallis, Dept. of Agricultural Economics, Environmental Protection Agency Contract 68-01-0423, Proj. 07AAC-02, Program Element 1H1094, Rept. EPA 600/5-74-017, 132p., July 1974. 69 refs.*

Outpatient medical costs related to air pollution in the Portland, Oregon area were estimated for the period 1969-1970. Statistical models explaining individual outpatient consumption of medical services were formulated; and measurements of suspended particulate air pollution and meteorological parameters, as well as socio-economic and demographic variables, were included in the models as explanatory variables. Although air pollution did appear to have an effect on the consumption of outpatient medical services for certain respiratory diseases, air pollution exerted a minimal effect in terms of cost (quantity of medical services consumed per contact with the medical system). Air pollution affected the number of visits but not the cost per visit. (Author abstract modified)

52633 **APTIC NO. 74411**

Kitamura, Masatsugu, Kimiaki Sumino, and Yukio Iida

EFFECTS OF HEAVY METALS ON THE ACTIVITY OF MOUSE ENCEPHALIC PHOSPHODIESTERASE.

(Mausu no Phosphodiesterase no kassei ni oyobosu jukinzoku no eikyo). Text in Japanese. Supplement, Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10):352, Oct. 1974. (Presented at Japanese Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 466.)

The effect of copper, cadmium, lead, inorganic mercury, and methyl mercury on enzymatic activity in vitro was studied with cyclic AMP on mouse cerebrum homogenate, with phosphodiesterase as indicator. The homogenate was made from the cerebrum of dd-strain mice (22-27 g). The activity was measured by the two-step reaction method of Butcher and Sutherland. The reaction solution contained 40 micromoles Tris-HCl, pH 7.5, 2 micromoles MgCl2, 0.7 micromoles cyclic AMP, desired amounts of phosphodiesterase test material, and heavy metal or methyl mercury. Heavy metals were added as aqueous solutions of copper chloride, mercuric chloride, cadmium nitrate, and lead nitrate. Reaction solution (0.9 ml) was incubated at 35 C for 30 min. After 20 min of incubation, 0.1 ml of Crotalus atrox venom solution (0.1 mg venom) was added, and the reaction was stopped by addition of 0.1 ml of 55% TCA solution. After centrifugation, the Pi in the supernatant liquid was determined by colorimetry. The average value of phosphodiesterase activity in the control was 1.2 micromoles Pi/30 min/mg protein. All the heavy metals inhibited phosphodiesterase activity (to 83%) with increases in concentrations (0-200 ppm), but lead at low concentrations (10-20 ppm) initially enhanced the activity (10% enhancement). Mutual interactions were not observed when two or more of the heavy metals were present together.

52634 APTIC NO. 74730

Makino, K., I. Mizoguchi, Y. Sato, M. Osawa, M. Fukuda, and H. Yagyu

EXPERIMENTAL STUDIES ON EYE IRRITATION DUE TO PHOTOCHEMICAL SMOG (REPORT NO. 2). *(Kokagaku sumoggu ni yoru gan shigeki sayo no jikkenteki kenkyu (Dai-2-ho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution Research), 9(2):340, Nov. 1974. (Presented at the Japan Society of Air Pollution, National Meeting, 15th, Paper 195.)*

Sexual differences in reaction to eye irritation by photochemical smog were investigated with 22 subjects (12 male, 10 female college students). Automobile exhaust was introduced into a smog chamber, and photochemical smog was formed by irradiation with ultra-violet rays. Exposure time to smog was 2 minutes. Eye irritation occurred within 1-30 sec of exposure, when exposure was accompanied by a strong feeling of irritation. For males there was high correlation between eye irritation and temperature, oxidants, and ozone. For females there was hardly any. Studies on GSR (electrical skin reflection) showed that there was a conscious response, depending on the presence or absence of eye irritation, for both males and females.

52635 APTIC NO. 76651

Mizoguchi, I., M. Ozawa, M. Fukuda, and N. Okawada

EXPERIMENTAL STUDIES ON TEAR LYSOZYME LEVELS USING SMOG CHAMBER. *(Sumoggu chanba ni yoru namida rizochimu ni kansuru jikkenteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):341, Nov. 1974. (Presented at the Japan Society of Air Pollution, National Meeting, 15th, Paper 196.)*

Changes in tear lysozyme concentrations when eyes were exposed at a smog chamber eye port to acrolein or to exhaust gas irradiated with ultra-violet rays were investigated. Maximum concentrations of exhaust gas pollutants were: oxidant (0.38 ppm); ozone (0.24 ppm); nitrogen dioxide (0.7 ppm); nitric oxide (0.1 ppm); hydrocarbon (total) 20 ppm C); carbon monoxide (70 ppm); sulfur oxides (0.01 ppm); and PM (above 0.3 micron) (170 particulates/cc). The temperature was 27-28 C and humidity was 50-67%, because of the Japanese wet season. Tears were collected on antiseptic filter paper, and lysozyme measurements were taken with Quanti-Plate (Kellestad Co). Five males (26-43 years old) with no eye ailments were exposed to acrolein (1 ppm for 5 min). All five subjects reported eye pain. The average lysozyme levels dropped from 1000 micrograms/ml before exposure to about 500 micrograms/ml immediately after exposure. After an hour, the lysozyme level was nearly back to pre-exposure levels. Upon exposure to exhaust gas pollutants for 10 min, 11 out of 28 subjects (14 each of males and females; 20-26 years old) experienced various stages of eye irritation, from a slight stinging sensation to tears. Changes in lysozyme levels for these 11 behaved identically to changes in lysozyme levels for all 28 subjects. Lysozyme concentrations began to increase immediately after exposure, from 1000 micrograms/ml to 1300 micrograms/ml after 1-2 hr. By the end of 3 hr, lysozyme concentrations were back to pre-exposure levels.

52636 APTIC NO. 74380

Nakaya, S., S. Sakurai, K. Itai, Y. Suzuki, and F. Tsunoda

ON THE SIGNIFICANCE OF URINARY FLUORINE CONCENTRATION AS AN INDICATOR OF EXPOSURE TO FLUORIDES. *(Fukka butsu bakuro shihyo to shite no nyochu fusso nodo no igi ni tsuite). Text in Japanese. Taiki Osen Kenkyu J. Japan. Soc. Air Pollution), 9(2):346, Nov. 1974. (Presented at the Japan Society of Air Pollution, National Meeting, 15th, Paper 201.)*

The behavior of urinary fluorine upon long-term urine storage was investigated. When the pH of urine changes from 5-6 to 9 (2-3 mo storage at 30 C; 2-liter sample of 24-hour urine collection in polyethylene jar), because of ammonia fermentation, most of the fluorine precipitates as calcium fluoride. Thus, fluorine analysis by the direct ion electrode method would give erroneous results for total fluorine content. Storage of the 2-liter samples at 0 C maintained the pH at 6, and fluoride precipitation was not marked at the end of 2-3 mo. Storage of urine in 10-milliliter polyethylene test tubes at 0, 20, 40 C, for a 3-week period, did not result in any significant reduction in values of average fluorine content, upon analysis by the direct ion electrode method. The steam distillation method for fluorine analysis results in values 1.5 times those obtained from direct ion electrode analysis.

52637 APTIC NO. 74365

Nishimura, Hideo

CONSIDERATION ON CO POISONING DURING PREGNANCY AND MICROCEPHALIC CHILD. *(Ninshin-chu no CO chudoku to ko no shoto-sho). Text in Japanese. Senten Ijo (Congenital Anomalies), 14(1):41-46, 1974. 32 refs.*

Considerations necessary to establish the possible relationship between the birth of a microcephalic boy and carbon monoxide intoxication of the mother during her third month of pregnancy are reviewed. The following areas for investigation are suggested: a review of the child's genetic background and the mother's history; studies of factors contributing to microcephaly, including related animal experiments; the examination of case reports on CO intoxication during pregnancy with special reference to types of anomalies manifested in the offspring; a determination of the critical period for induced microcephaly; including studies on radiation-induced microcephaly; and possible teratogenic effects of other concurrent environmental influences such as emotional shock and medical treatment during pregnancy.

52638 APTIC NO. 74590

Reif, E., D. Post, V. Graef, W. Steioff, K. H. Tiedtke, J. Rutenfranz, and W. Sbresny

EXAMINATION OF LEAD WORKERS IN A HESSIAN STORGAGE BATTERY FACTORY. *(Untersuchungen an Bleiarbeitern einer hessischen Akkumulatorenfabrik). Text in German. Oeffentl. Gesundheitswesen (Stuttgart), 36(11):787-798, 1974. 26 refs.*

Sixty-two workers exposed to lead were examined and lead dust pollution in the factory was determined. The following biological parameters were investigated: stipple cells, hemoglobin and hematocrit, lead in the blood, alpha-amino-levuline acid-porphobilinogen, and alpha-amino-levuline acids in the urine. The air contaminated with lead dust was drawn through a Gravikon-WL-10/40 sampler and passed over glass filter paper. After gravimetric determination of the dust fall on the filter, the lead content was determined by a photometric method using diphenyl thiocarbazone (dithizone) which formed a red complex with lead. Lead concentrations in the air consistently and substantially exceeded maximum allowable concentrations (0.2 mg/cu m). Stipple cells in the face were absent in most cases. The urinary coproporphyrin levels showed no clear correlation with the stipple cell count. A negative relationship between the ALA-dehydratase and the blood lead level was established. Delta-ALA dehydratase was found in 50% of the cases. Blood lead levels of up to and over 100 micrograms/ml were measured.

52639 **APTIC NO. 74823**

Sato, Y., N. Konno, and F. Tsunoda

ON THE EFFECTS OF ENVIRONMENTAL POLLUTION BY AIRBORNE FLUORIDES ON EXPERIMENTAL GOATS (V). PLACENTAL TRANSMISSION OF FLUORIDE (CONTINUED). *(Taikichu fukkabutsu no kankyo osen ni yoru yagi no bukuro jikken (Dai-5-ho). Fukkabutsu no taiban tsukasei (Zokuho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):348, Nov. 1974. (Presented at the Japan Society of Air Pollution, National Meeting, 15th, Paper 203.)*

Studies were made with goats on the correlation of fluorine concentrations in maternal serum with fluorine concentrations in placenta and offspring. Goats were divided into three groups: one control, and two pollution-exposed. Offspring were jugulated after birth, and amounts of fluorine in serum, tissues, organs, and various skeletal structures were determined. Fluorine concentrations in maternal serum ranged from 0.043-0.065 ppm for the control groups, and 0.098-0.292 ppm for the exposed groups. In the offspring, serum fluoride concentrations ranged from 0.010-0.016 ppm for the control group, and 0.018-0.031 ppm for the exposed groups. Placental fluorine concentrations (2.2-4.5 ppm) were higher than maternal and offspring serum fluorine concentrations, but no significant differences were found among the three groups. In all three groups, highest and lowest fluorine accumulations were found in the same types of tissues, organs, and skeletal structures. In tissues and organs, fluorine contents were highest in the aorta (5.1-5.5 ppm) and spleen (5.4-7.9 ppm), and lowest in the brain (0.48-1.75 ppm) was muscle (0.72-1.15 ppm). In skeletal structures, fluorine content was lowest in molars (73.9-259 ppm), and highest in rib (149-569 ppm) and vertebra (152-545 ppm).

52640 **APTIC NO. 76650**

Takemoto, Kazuo, Hideo Kawai, and Harukazu Endo

EFFECTS OF ATMOSPHERIC POLLUTION ON RESPIRATORY ORGANS (III). AMOUNT OF HEAVY METALS AND DEGREE OF LUNG POLLUTION IN HUMAN AND DOG LUNGS. *(Taiki osen no kokyuki ni oyobosu eikyo (III). Hito/inu hai no hai osendo to jukinzoku ryo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):344, Nov. 1974. (Presented at the Japan Society of Air Pollution, National Meeting, 15th, Paper 199.)*

Patho-histological studies on lung pollution and heavy metal content were conducted on human and mature dog lungs from Japan and South Korea. Lung tissue samples were taken from human and dog lungs which were used as patho-histological specimens in medical school. Five levels of lung pollution were defined by examinations by naked eye, and histological examinations. Human lung specimens were from Tokyo, and all five lung pollution levels were present. Of the 13 heavy metals found in human lungs, amounts of zinc, cadmium, nickel, cobalt, lead, and chromium showed some correlation with levels of lung pollution. Iron and calcium were unreliable indicators. Copper and magnesium showed poor correlation and tin, tantalum, and beryllium were present in trace amounts for both human and dog lungs. Dog lungs came from Tokyo, the residential suburbs of Aichi, Japan, urban Seoul, Inchon, and Korean farming areas. The highest pollution effects were found in Tokyo dog lungs. Dog lungs from Aichi and Seoul showed the next lower levels of pollution effects; Inchon and farming areas showed the least pollution effects. No correlation was found between amounts of Fe, Cu, Zn, Co, and lung pollution. Probably because of the Korean soil, the magnesium content was higher in dog lungs from Korea. Correlation was found between Cd, Ni, Pb, and especially Cr and degrees of regional and lung pollution.

52641 **APTIC NO. 74821**

Tsuji, Yoshito

ENVIRONMENTAL POLLUTION BY FLUORIDE AND ITS INFLUENCE ON THE HUMAN BODY. *(Fukkabutsu ni yoru kankyo osen to seitai eikyo). Text in Japanese. Supplement, Nippon Koshu Eisei Zasshi (Japanese J. Public Health), 21(10):[illegible]74, Oct. 1974. (Presented at the Japanese Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974.)*

The cumulative effects of fluorine on the human body are disclosed. The incidence of fluorosis (mottled teeth) increases sharply as a cumulative effect of fluorine concentrations above 1.0-1.5 ppm in the drinking water. In Japan, the threshold fluorine concentrations seem to be 0.5-0.6 ppm, although mottled teeth have occurred at fluorine concentrations of 0.3-0.4 ppm in drinking water. Prevention of tooth decay by fluoridation (1 ppm) of drinking water is considered safe, and is practiced in the United States. Low amounts of fluorine cause osteosclerosis, while large amounts cause softening of the bones. Schoolchildren with 3rd degree (heavily) mottled teeth were small in height, while those with 1st degree mottling were somewhat taller than average. In Kitakata, schoolchildren from areas of high fluoride pollution had a higher incidence of goiter, but an increase in growth with trace amounts of fluorine was also observed. Fairly rapid excretion of fluorine from the body in urine was found in studies conducted on workers from Showa Denko, Kitakata. In experiments conducted at this school with tadpoles and fertilized sea urchin eggs, the presence of 5 ppm sodium fluoride resulted in faster emergence of frog forelegs and a higher percentage of formation of normal spines on sea urchins than in the absence of sodium fluoride. At fluoride concentrations above 25 ppm, deformed sea urchins with no skeletal structures were observed.

52642 **APTIC NO. 74580**

Tsunoda, Humio

RECENT TREND IN THE RESEARCH ON HUMAN HEALTH EFFECTS OF AIR POLLUTION. *(Saikin no taikiosen ni kansuru igakuteki kenkyu no doko). Text in Japanese. Iwate Igaku Zasshi (J. Iwate Med. Assoc.), 26(5):516-522, Oct. 1974. 42 refs.*

The present state of air pollution in Japan is outlined with respect to the major air pollutants; and the health effects of sulfur dioxide reviewed in relation to the amendment of the air quality standard from 0.06 to 0.04 ppm daily average value. The additive health effects of SO2 and nitrogen dioxide are also described. Long-term exposure to NO2 at low concentrations causes hyperplastic foci due to the proliferation of bronchiolar epithelial cells, suggesting a relationship between NO2 in air and lung tumorigenesis. The effects of suspended particulates and carbon monoxide and differences between symptoms resulting from Japanese photochemical oxidants versus those in Los Angeles are described along with proposed criteria. The accumulation of airborne fluorides in agricultural crops is compared to its minute concentration in air.

52643 **APTIC NO. 74366**

Osaka Prefectural Inst. of Public Health (Japan), Environmental Health Lab.

ON THE EFFECTS OF AUTOEXHAUST AND PHOTOCHEMICAL OXIDANT ON MOUSE. *(Haikigasu oyobi okishi-danto no mausu ni oyobosu eikyo showa 46 nendo). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog), no. 1:292-298, Feb. 1974. 5 refs.*

Mice who were 3-weeks old were exposed to artificially generated photochemical oxidant at 0.1 - 0.6 ppm and to autoexhaust containing 40 - 60 ppm of CO (2 hr/day) for 9 weeks. Thereafter, radioactive gold was injected into the mice, and the radioactivity in the blood was determined after 2 and 12 min of injection. Another mouse, after 9 weeks of exposure, was sprayed with radioactive gold aerosol, and the radioactivity of gold in the lung was determined after 15 min and 18 hr of spraying. Animals exposed to auto exhaust showed a decrease in liver and lung weight, a periodic decrease in leukocytes which recovered after 3 days, a decrease in gold excretion, and an increase in alveolar macrophages. Animals exposed to artificial oxidant showed a decrease in lymphocytes and an increase in neutrocytes, a periodic decrease in leukocytes which recovered after 3 days, a decrease in gold removal, and an increase in alveolar macrophages. Autoexhaust and photochemical oxidants thus appear to affect mice differently.

1973

52644 **APTIC NO. 74615**

Antweiler, H.

AIR POLLUTION BY PHYSICOCHEMICAL NOXAE. *(Chemisch-physikalische Noxen durch verunreinigung der Atmosphaere). Text in German. Verh. Deut. Ges. Inn. Med., vol. 79:38-46, 1973.*

General problems of air pollution and its effects on health are presented. The effects of air pollution on health can be studied on exposed subjects, on comparable populations, and especially in animal tests. After passing through a range of adaptation, increasing pollutant concentrations cause reversible or irreversible functional or morphological changes in the organism. Smog periods occurring under inversion conditions, and substantially lower background concentrations occurring normally are distinguished. Correlation between the concentrations of pollutants, especially sulfur dioxide and particulate matter, and the incidence of respiratory diseases, such as emphysema and bronchitis, was established. Nitrogen dioxide SO2, and ozone may increase the susceptibility of the organism to pathogenic germs, and NO2 and oxidants may potentiate the effect of SO2 in bronchitis, emphysema, and bronchial asthma. Inhibition of the psychomotor activity in drivers, and especially in smoking drivers, by carbon monoxide was evidenced. Recent studies indicate no real acute hazards due to lead as emitted by motor vehicles. Asbestos caused asbestosis, lung cancer, and mesothelioma of the pleura and peritoneum, both in occupationally exposed subjects and those living around asbestos- processing plants. The carcinogenic effect of asbestos is due to its needle shape rather than to its chemical composition.

1972

52645 **APTIC NO. 76693**

Starr, C., M. A. Greenfield, and D. F. Hausknecht

PUBLIC HEALTH RISKS OF THERMAL POWER PLANTS. *California Univ., Los Angeles, School of Engineering and Applied Science. The Resources Agency of California, Rept. UCLA-ENG-7242, 68p., May 1972. 21 refs.*

An analysis of the public health risks associated with oil-fired and nuclear power plants in an urban setting is presented. The public health risk from routine operation of electrical generation plants using either type of fuel appears to be extremely low. Routine operation of nuclear plants presents a significantly smaller public health risk than routine operation of oil-fired plants, typically by a factor of 10-100. The public health risks due to accidental releases from either nuclear or oil-fired plants are both of the same magnitude and are about 100,000 times smaller than the risks associated with the routine operation of the plants. The maximum hypothetical accidents associated with either plant type are not likely to be sufficiently large to have a significant public health impact when compared to the normal incidence of disease. The percentages above background permitted by various regulations for radiation, sulfur dioxide, and nitrogen dioxide are 1, 10,000, and 400%, respectively. A review of the pathways and health effects of the above pollutants is also included. (Author summary modified)

52646 **APTIC NO. 76701**

Inst. fuer Dokumentation und Information ueber Sozialmedizin und oeffentliches Gesundheitswesen, Bielefeld (Germany)

DOCUMENTATION CONCERNING THE EFFECTS OF AIR POLLUTION ON THE ENVIRONMENT AND ON HEALTH. *(Dokumentation der Einwirkungen der Luftverunreinigung auf Umwelt und Gesundheit), 18p., 1972. 880 refs.*

A bibliography containing 880 entries dealing with the effects of air pollution on the environment and human health in particular is presented. The literature cited is from the years 1971 and 1972. The entries are arranged in alphabetical order by author. A separate author listing which includes the author s location by city is also provided. The periodicals covered in the bibliography represent areas dealing with atmospheric interactions, measurement methods, occupational safety and health, toxicology (animals and human), and control methods.

1971

52647 **APTIC NO. 74625**

Strusinski, Artur and Halina Wyszynska

DETERMINATION OF IRON, COPPER, ZINC, AND LEAD IN ATMOSPHERIC AIR. *(Oznaczanie zelaza, miedzi, cynku i olowiu w powietrzu atmosferycznym) Text in Polish. Roczniki Panstwowego Zakladu Higi., 22(6):649-656, 1971. 26 refs.*

The toxic properties of iron, copper, zinc, and lead compounds and methods used for their determination in the air are presented. Iron salts have a corrosive effect. Iron oxides in fumes and dusts cause respiratory diseases. Copper salts in high concentrations irritate the digestive and respiratory tracts. Zinc oxides, generated by heating of zinc to the boiling temperature are highly toxic. The fumes of chlorine and sulfur compounds of zinc have an irritating and corrosive effect on the respiratory tract (emphysema). Lead is highly toxic in all compounds and possesses a cumulative activity. The most appropriate colorimetric methods for the determination of iron, copper, zinc, and lead in air are described. The methods are characterized by sufficient sensitivity, selectivity, and simplicity. They were used in 1967 in Poland to determine the iron, copper, zinc, and lead contents of the air of 10 large Polish cities. The monthly mean values were: 2-4.5 micrograms/cu m for iron, 0.05-0.19 micrograms/cu m for copper, 0.48-1.0 micrograms/cu m for zinc, and 0.07-3.72 micrograms/cu m for lead.

52648 **APTIC NO. 74373**

Chiba Univ. (Japan), Committee of Investigation on The Effect of Air Pollution on Human Body in Fuji City and Fuji Area

INVESTIGATION ON THE PREVALENCE OF RESPIRATORY SYMPTOMS IN EMPLOYEES OF THE FUJI

MUNICIPAL OFFICE. (Fuji shiyakusho shokuin no kokyuki shojo yushoritsu chosa). Text in Japanese. 16p., 1971.

Employees (over 40 yr old) of the Fuji Municipal Office (322 males and 220 females) received the following examination during March 23-26 of 1971 to assess the prevalence of respiratory symptoms: direct interview using a short questionnaire on respiratory symptoms, lung function tests, measurements of blood pressure, and body weight and height changes. Those subjects living in Fuji for more than 10 yr amounted to 73% of the group and those living in Fuji for more than 5 yr accounted for about 90%. In comparison with results of investigations in 23 wards of Tokyo (1966-68), the Santama area (1969), and the Isogo-ward of Yokohama City (1967), the prevalence of respiratory symptoms was relatively high, especially in males. The prevalence of chronic bronchitis ranged from 6.6% to 17.0% in males. Lung function tests revealed disorders in 25.2% of the males and 20.7% of females.

1970

52649 **APTIC NO. 76689**

Arkhipova, O. G. and I. V. Pavlova

BIOCHEMICAL RESEARCH IN THE STUDY OF THE TOXICITY OF CHEMICAL SUBSTANCES. *In: Principles and Methods of Establishing Maximum Allowable Concentrations of Harmful Substances in the Air of Industrial Locales. Proceedings of the International Conference of Scientists of Socialist Countries, Nov. 25-29, 1968. Printsipy i Metody Ustanovleniya Predel no Dopustimykh Kontsentratsiy Vrednykh Veshchestv v Vozdukhe Proizvodstvennykh Pomeshcheniy. Materialy Mezhdunarodnogo Seminara Uchenykh Sotsialisticheskikh Stran 25-29 Noyabrya 1968, Moscow (USSR), Meditsina Publishing House, 1970, p. 41-47. Translated from Russian by Gale M. Weisenbarger, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, Foreign Technology Div., 19p., 1970.*

NTIS, DDC: ADA 001846

The use of various biochemical procedures to investigate the toxicity of poisonous substances is discussed, with particular emphasis on the basic mechanisms of toxic reation and the effects of poisons on metabolic processes. In vitro studies involving the interaction of poisons with protein in the serum and the organs, induced changes in the activity of enzymatic systems, and the effects of poisons on cell permeability are reviewed. The toxic action of nitrites is discussed in relation to the formation of methemoglobin and nitroxylhemoglobin. Substances that penetrate very rapidly into the cell include hydrocarbons (saturated, unsaturated, and cyclic), halogenated hydrocarbons, monoatomic alcohols, aldehydes, nitrites, ethers, and many organic acids. Enzymatic poisons which react with separate functional groups of the enzyme include: mercury, lead, arsenic, hydrogen cyanide, carbon monoxide, nitric oxide, and hydrogen sulfide.

1969

52650 **APTIC NO. 74595**

Klosterkoetter, W. and K. Robock

EXPERIMENTAL STUDIES ON THE ACTION MECHANISM OF ASBESTOS WITH RESPECT TO THE FIBER LENGTH. *(Experimentelle Untersuchungen zum Wirkungsmechanimus von Asbest unter besonderer Beruecksichtigung der Faserlaenge). Text in German. Arbeitsmedizin/Sozialmedizin/Arbeitshygiene, vol. 36:111-130, 1969. 56 refs. (Presented at the 1969 Annual Conference of the German Society of Occupational Medicine, Saarbruecken, West Germany, May 1-3, 1969.)*

Experiments on the fibrogenic, cytotoxic, and carcinogenic effects of different types of asbestos fibers in rats are described. Following intraperitoneal and intratracheal introduction, chrysotile, amosite, and crocidolite fibers longer than 5 micron were fibrogenic, while fibers shorter than 2 micron were inert. Crocidolite and amosite fibers longer than 5 micron induced peritoneal mesotheliomas, but fibers shorter than 2 micron were not carcinogenic. The fibrogenic effect of asbestos fibers was not inhibited by the prolonged administration of polyvinylpyridine-N-oxide, a well-known silicosis inhibitor. Asbestos fibers exerted a moderate to strong cytopathogenic effect on Guinea pig macrophages. The cytopathogenic effect was weaker than that of quartz in all cases. The cytopathogenic effect correlated with the specific surface and, to a certain degree, with the activation energy of the electron traps. Grinding asbestos fibers to lengths below 1 to 2 micron, which results in a reduction of the luminescence intensity and the activation energy of the electron traps, resulted in the cessation of the cytopathogenic effect.

EFFECTS-PLANTS AND LIVESTOCK

1975

52651 **APTIC NO. 74356**

Fukuoka, S.

PHOTOCHEMICAL SMOG PHENOMENA AND PLANT DAMAGE DUE TO THEM IN TOKYO. PART 4. PLANT DAMAGE DUE TO PHOTOCHEMICAL SMOG. *(Tokyo ni okeru kokagaku smoggu gensho to shokubutsu higai. Dai 4-sho. Kokagaku smoggu ni yoru shokubutsu higai). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 34:35-67, March 1975.*

The effects of Tokyo-type photochemical smog on plants and the mechanism of plant damage were investigated. Field surveys of damage to trees, agricultural crops and horticultural crops were performed along with exposure experiments in an artificial weather chamber where plants were exposed to components of photochemical pollutants such as ozone, ozone plus sulfur dioxide, and peroxyacetyl nitrate. Changes in plant pigments and effects on cellular morphology were assessed. The results are described in detail.

52652 **APTIC NO. 74984**

Hatta, Haruko and Kazuya Terakodo

INJURIES OF MORNING GLORY DUE TO PHOTOCHEMICAL OXIDANT AND ITS PROPERTIES AS AN INDICATOR PLANT. PART 2. RELATION BETWEEN THE POSITION OF INJURED LEAF AND AGE OF THE LEAF DUE TO OXIDANT. *(Oxidant ni yoru asagao no higai to sono shihyosei ni tsuite Dai 2-ho. Oxidant ni yoru asagao no higai yoi to yorei to no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(4):729-733, Feb. 1975. 16 refs.*

Morning glories exposed to photochemical oxidants were examined to establish a correlation between the position of the leaves damaged and the leaf age. Early in September the uppermost leaf which showed oxidant injury was the fifteenth one from the top when one leaf developed per day; the damaged area/leaf area became larger as the leaf position lowered. Damage appeared on leaves which stopped developing. The relationship between damage and stomatal aperture was seen on the lower surface of the leaves. The chlorophyll and sugar contents were highest in the ninth leaf from the top, and they were consistently low in leaves located at positions receiving oxidant damage. Leaves susceptible to oxidant damage were located lower than leaves with maximum metabolic activity.

52653 **APTIC NO. 74754**

Honma, Makoto and Kazuto Shirata

POLLUTION BY HEAVY METALS IIN THE NEIGHBORHOOD OF THE NISHITAMA FACTORY OF JAPAN PORTLAND CEMENT CO., LTD. *(Nihon semento nishitama kojo shuhen no jukinzoku osen ni tsuite). Text in Japanese. Preprint, Japan Society for General Research, Tokyo Environmental Science Div., p. 132-133, 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

In December 1972 a large amount of cadmium was found in the rice grown in Hinode Village, Nishitama-gun, Tokyo. The content of cadmium exceeded 0.4 ppm which is the upper legal limit. In order to identify the origin of the pollution, samples were collected from various places including the bottom of rivers, rice fields, and forests. The analysis was made by the atomic absorption spectroscopy. The soil where the rice that contained high cadmium levels was grown was rich in Cd, zinc, copper, and lead. The contents of these elements in the upper soil layer were much higher than those in the lower soil River water also showed high levels of the metals downstream of a factory. The cadmium content of the soil was measured in eight directions from the facctory, up to a distance of 5 km. The geographic distribution of the Cd content clearly showed that the factory was the origin of the pollution. The heavy metals were mostly transported through the air and deposited on the earth. Precipitation on building roofs generally showed very high levels of heavy metals.

52654 **APTIC NO. 74653**

Inden, T.

REDUCTION OF SULFUROUS ACID GAS INJURY ON VEGETABLES BY LIGHT AND ITS MECHANISM. *(Sosairui no ashosan gas shoga no hikari ni yoru keigen to sono kisa). Text in Japanese. Nogyo oyobi Engei (Agr. Hort.), 50(6):788-790, June 1975. 6 refs.*

Tomato, cucumber, egg-plant, pimento, and spinach were exposed to nitrogen dioxide under various natural light conditions. Relationships between the injury due to the gas and light conditions and between injury and nitrous acid reductase and light conditions were examined. Plant injury due to nitrogen dioxide was less when the light intensity was great. Nitrogen dioxide anion levels in leaves exposed to light and having stomatal apertures large enough to allow nitrogen dioxide invasion were less than those in leaves under dark conditions. The reaction by which nitrogen dioxide anion was rendered harmless proceeded rapidly under light conditions. Leaves treated with 6-(3 4- dichlorophenyl)-1,1-dimethylurea showed a high susceptibility to nitrogen dioxide gas even during light conditions. Nitrogen dioxide absorbed into leaves appears to be photochemically reduced to a harmless state.

52655 **APTIC NO. 74588**

Iwanaga, T.

A PROBLEM OF ENVIRONMENTAL POLLUTION IN RURAL AREAS OF GIFU PREFECTURE. *(Gifu-ken noson ni okeru kogai mondai). Text in Japanese. Nihon no Kagakusha (Japan. Sci.), 10(7):329-332, July 1975.*

A problem of untimely defoliation of Japanese pear trees in orchards of Kamo City, Gifu Prefecture which occurred in the summer of 1971 was investigated. The damage to leaves began from both the apex and the periphery as discoloration and then proceeded to the central part. The cause of the untimely defoliation was suspected to be fluoride-containing exhaust from a tile factory. Experiments in which pear leaves were exposed to aqueous hydrogen fluoride solution revealed the accumulation of fluorine in pear leaves, and the major cause of the untimely defoliation was thus attributed to fluoride in the exhaust from the tile factory and also to sulfur dioxide.

52656 **APTIC NO. 74496**

Kawamata, M.

INVESTIGATION OF THE DAMAGE OF MORNING GLORY DUE TO PHOTOCHEMICAL SMOG BY CITIZEN OF TACHIKAWA. *(Tachikawa shimin ni yoru kokagaku smog no asagao higai chosa). Text in Japanese. Preprint, Japan Society for General Research, p. 75-76, 1975. (Presented at the Japan Society for General Research, Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Photochemical smog damage to morning glory was investigated in 1974 at 106 points throughout Tachikawa. Criteria used were: damage to the five leaves from the uppermost leaf damaged, the leaf area damaged, and classification of the lesion as white or black. The first occurrence of the damage was observed on June 15, and there were 19 occurrences during the season. Damage was observed when the oxidant concentration reached 9-10 pphm. The observations coincided with experiments carried out by the Tokyo Metropolitan Agricultural Experiment Station.

52657 **APTIC NO. 74656**

MacLean, D. C.

THE OXIDES OF NITROGEN AS PHYTOTOXIC AIR POLLUTANTS. *(Die Stickstoffoxide als phytotoxische luftverunreinigungen). Text in German. Staub, Reinhaltung Luft, 35(5):205-210, 1975. 34 refs.*

The direct effects of nitrogen oxides on vegetation are reviewed. Reports that relate nitrogen oxide effects to known concentrations and durations of exposure are emphasized. A discussion of air quality standards in the USA, Japan, and the Federal Republic of Germany indicated that all of these standards should provide reasonable economic protection from nitrogen dioxide induced plant damage. In addition, these standards would protect plants from photochemical oxidants resulting from reactions involving NO2.

52658 **APTIC NO. 74430**

Matsubara Hishao, Hirokatsu Suda, Tadaski Sawada, and Isemu Nouchi

REARING OF THE HIGHLY SUSCEPTIBLE STRAIN OF BEGONIA REX TO OZONE BY IONIZING RADIATION MUTATION. *(Hoshasen ikushu ni yoru Begonia rex no ozone ni taishite kanjusei no takai keito no ikusei). Text in Japanese. Nogyo oyobi Engei (Agr. Hort.), 50(6):811-812, June 1975. 3 refs.*

The rearing of a strain of Begonia rex which is highly sensitive to zone by ionizing radiation mutation breeding is described. The parent strain (Winter Queen), two mutants, Winter Queen gamma-1 and Winter Queen gamma-3 are exposed to ozone at 0.15 ppm for 3, 6, and 12 hr in a phytotron utilizing natural day-light. Morphological differences between the three strains are investigated before exposure. No visible change is observed after 3 hr exposure; however, after 6 hr of exposure, bleached spots peculiar to ozone injury appeared on matured leaves of the original and the mutant gamma-3 strains. The spots change to a more conspicuous water-soaked- like, bleached type after 2 days of exposure. The lesion does not enlarge afterwards. The leaves then turn brown and drop off. Susceptibility to zone is highest for the mutant gamma-3 strain, followed by the original strain, and then by the mutant gamma-1 strain, without individual variation. The mutant gamma-3 possesses yellowish-green leaves which absorb more light, causing greater susceptibility to ozone.

52659 **APTIC NO. 74461**

Miyake, Yoshiyuki and Yoshio Uno

ON THE INJURY OF CIGAR WRAPPER TOBACCO, BEL W3 STRAIN, TO OXIDANT - THE HISTORY AND RESULTS OF RESEARCH ALREADY OBTAINED OF THE STRAIN. *(Hamaki tabako Bel W3 no oxidant shogai ni tsuite - Bel W3 hinshu no rairekito kison* *no kenkyu seika). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(3):584-593, 1975. 37 refs.*

The susceptibility of the tobacco strain, Bel W3, to ozone- induced leaf spot is discussed. Topics covered include: the history of breeding Bel W3 as an indicator plant to oxidant, varietal differences and the occurrence of spots in Bel strains exposed to ozone, the relationship between the growth environment and stomatal aperture of Bel strains and ozone susceptibility and the relationship between the constituents of Bel strains and their susceptibility to ozone. Experiments with chemicals that prevent ozone injury to Bel B3, such as N N-diphenyl-p-phenylenediamine, are also described.

52660 **APTIC NO. 76744**

Nouchi Isamu, Totomu Iijima, and Toshio Odaira

EFFECTS OF PEROXYACETYL NITRATE (PAN) ON PLANTS. PART 1. SYMPTOMS OF INJURY OF HERBACEOUS PLANTS AFFECTED BY PAN. *(Shokubutsu ni oyobosu paaokishi asechiru naitoreto (PAN) no eikyo. I. PAN ni yoru sohon shokubutsu no higaishojo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(3):635-643, 1975. 21 refs.*

Several species of plants such as chard, spinach Japanese radish, radish, tomato, peanut, Welsh onion, lettuce, kidney bean, and petunia were exposed in conditoned chamber to peroxyacetyl nitrate, artifically synthesized at 10 and 20 pphm (30 ppb for petunia only). Susceptible plants such as chard, spinach, Japanese radish, kidney bean, tomato, petunia, and lettuce showed leaf injures after exposure to PAN at 10 pphm for 6-10 hr; petunia (white ensign) was affected at only 3 pphm. Except for peanut plants, the symptoms appeared as depressed spots with glazing and bronzing on the under side of leaves; the symptoms extended to the upper side of the leaves at 20 pphm and appeared generally on younger leaves. Microscopically, injury occurred specifically in cells of spongy parenchyma tissue (cell destruction and coloring). Plant injuries observed in fields exposed to high oxidant levels are similar to those observed in this experiment.

52661 **APTIC NO. 74919**

Odaira, T.

AIR POLLUTION PHENOMENON BY PHOTOCHEMICAL REACTION AND THE PLANT DAMAGE DUE TO THE AIR POLLUTION. *(Kokagaku hanno ni yoru taikiosengensho to sono shokubutsu higai). Text in Japanese. PPM (Japan), 6(8):16-41, Aug. 1975. 27 refs.*

The formation of photochemical smog, its constitution, its fluctuation with meteorological conditions, the behavior of the lower layer of the atmosphere, ozone concentrations, and investigations of secondary pollutants are discussed. Damage to plants such as rice, gladiolus, tulip, larch, morning glory, French bean, Zelkova, poplar, and Prunus yedoensis are described in detail, especially changes in chloroplasts after exposure to ozone and peroxyacetyl nitrate.

52662 **APTIC NO. 74498**

Ota, Y.

DAMAGE OF AGRICULTURAL CROPS DUE TO NEWER AIR POLLUTANTS AND PROBLEMS THEREOF. *(Atarashii taiki osen busshitsu ni yoru nosakumotsu higai to mondaiten). Text in Japanese. Preprint, Japan Society for General Research, p. 83-84, 1975. (Presented at the Japan Society for General Research, Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Photochemical smog damage to vegetables such as spinach, radish, and Welsh onion just before shipment, was observed in Japan, especially in the suburbs of larger cities. The symptoms closely resembled those observed on leaves of morning glory, consisting of chlorosis and necrosis. The species and varieties of vegetables apt to be damaged by photochemical smog were tabulated, and major symptoms were described in detail. The reddish withering of the leaf apex of ric plant was also due to photochemical smog. Invisible damage due to a reduction in photosynthesis was also detected. The effects of ethylene on plants, especially at higher concentration, included fruit thinning, the appearance of non-seed plants, changes in sex, and summer leaf fall. High concentrations of ethylene along highways and near petrochemical complexes were possibly responsible for the observed changes.

52663 **APTIC NO. 74988**

Pfeilsticker, Konrad and Christiane Markard

CADMIUM, LEAD, AND ZINC CONTENT OF FRUITS AND VEGETABLES FROM GARDENS IN AN INDUSTRIAL REGION. *(Cadmium-, Blei- und Zinkgehalt pflanzlicher Lebensmittel aus Kleingaerten eines Industriegebiets). Text in German. Z. Lebensm. Unters. Forsch. (Munich), 158(3):129-136, 1975. 21 refs.*

The cadmium, lead, and zinc contents in 136 samples of fruit and vegetables were taken from gardens in Dortmund in 1973 and were analyzed by mineralization. Five percent of the samples contained more cadmium, 13% more lead and zinc than thee proposed limits four these minerals. Based on average cadmium, lead, and zinc concentrations in fruit and vegetables, and an average per capita consumption of 160 g of vegetables and 280 g of fruit per day, 0.017 mg Cd, 0.238 mg Pb and 2.05 mg Zn per day and per capita would be ingested if only consumed.

52664 **APTIC NO. 74843**

Sato, H.

PLANTS AND URBAN ENVIRONMENT. *(Shokubutsu to Toshi-kankyo). Text in Japanese. Seikatsu Eisei (J. Urban Living Health Assoc.), 19(1):31-39, 1975. 20 refs.*

The effects of the urban environment on plants were considered in terms of temperature, soil moisture, light conditions, a pH, aeration, available nourishment, amount of parasitic worms, and toxic substances in air. The effects of air pollution were related to sulfur dioxide and the water-soluble sulfur in plants, the pH of rain, and the content of heavy metals in rain water. Photochemical smog was also related to plant damage. The effects of air pollution on plants also indicated the degree of air pollution.

52665 **APTIC NO. 74672**

Scholl, Gerhard

POSITIVE AND NEGATIVE EFFECTS OF NITROGEN COMPOUNDS ON PLANTS IN THE VICINITY OF A FERTILIZER FACTORY. *(Positive und negative Wirkungen von Stickstoffverbindungen auf Pflanzen im Einwirkungsbereich einer Duengemittelfabrik). Text in German. Staub, Reinhaltung Luft, 35(5):201-205, May 1975. 10 refs.*

At a distance of 300 m from a fertilizer plant, various grains and fodder plants, as well as spinach, string beans, and peas, were grown consecutively over a period of several years to determine the effects of various concentrations of nitrogen compounds emitted by a fertilizer plant on the cultivations. Injuries that were similar to those observed in fumigation experiments with nitrogen dioxide were observed in the leaves of the experimental plants. In relatively high concentrations, pollutants containing nitrogen were as toxic as sulfur dioxide. Lower concentrations had a positive stimulatory effect and increased vegetative growth. Legumes were the most sensitive to nitrogen pollutants. Production of chlorophyll was reduced in lupine and Alexandrine clover, although no visible injuries were observed. Nodule development of the lupine was significantly restricted. The contamination of food and fodder plants by nitrates was significant and was found to present a real danger to humans through the food chain

52666 **APTIC NO. 74305**

Shinohara Toshikiyo, Yoshitada Yamamoto, Hiroshi Kitano, and Michio Fukuda

STUDIES ON WEATHER FLECK ON TOBACCO LEAVES. PART 12. EFFECTS OF ENVIRONMENTAL CONDITIONS ON OZONE-SUSCEPTIBILITY OF TOBACCO PLANTS. *(Tobacco seiri-teki hantenbyo ni kansuru kenkyu. dai 12-ho. tobacco no ozone-kanjusei no oyobosu kankyo joken no eikyo). Text in Japanese. Okayama Tabaco Shikenjo Hokoku (Bull. Okayama Tob. Exp. Stn.), no. 35:3-21, March 1975. 58 refs.*

Three varieties of potted tobacco plants, H-2, H-mutant and Bel W3, were grown in a clear air room and then exposed to ozone at 8-40 pphm for up to 4 hr at 13 C and to a relative humidity of 65-75%. The degree of ozone-injury was assessed 48 hr after ozone exposure. Flecks appeared on leaves at 30 pphm/hr for H-2 and 20 pphm/hr for Bel W3. The degree of fleck appearance was not proportional to ozone dose. Short time-exposures at higher concentrations resulted in greater injury than long time-exposure at lower concentrations for equal doses. Plants grown at 23 C were more susceptible to ozone damage than those grown at 13 C. There was a negative correlation between the temperature at exposure and the degree on injury. After the exposure, the occurrence of flecks and their progress were accelerated at 23 C. Diurnal periodicity to ozone damage was also observed. Sugars such as sucrose, fructose, or glucose reduced the susceptibility of plants to ozone. Tobacco plants grown under low illumination (1.5 klux) were more susceptible to ozone than those grown under high illumination (15 and 33 klux). The illumination condition after ozone-exposure did not affect the degree of injury.

52667 **APTIC NO. 74814**

Shinohara, Toshikiyo, Yoshitado Yamamoto, and Hiroshi Kitano

STUDIES ON WEATHER FLECK OF TOBACCO PLANTS. PART 16. INTERVARIETAL DIFFERENCE OF OZONE-SUSCEPTIBILITY IN TOBACCO PLANTS. *(Tobacco no seiriteki hantenbyo ni kansuru kenkyu dai 16-po. ozone-kanjusei no hinshu-kan sai). Text in Japanese. Okayama Tabaco Shikenjo Hokoku (Bull. Okayama Tob. Exp. Stn.), no. 35:51-58, March 1975. 28 refs.*

Twenty representative cultivars of tobacco plants were exposed twice to 35 pphm ozone for 1 hr under an illumination of 23 klux at 13 C (seven leaf stage and sixteen leaf stage) in a chamber. The degree of injury (lesions on leaves) was assessed after 2 days. Although there were cultivars showing lower susceptibility (Enshu, Delcrest 66 and Bel W3) and higher susceptibility (GH-4) in the younger stage (seven leaf - eight leaf), intervarietal difference of susceptibility to ozone did not change through growing stages, and a high correlation (0.96) existed between susceptibilities at the eight leaf stage and at the 16 leaf stage. A high correlation (0.9) also existed between the degree of fleck occurrence and ozone susceptibility. The correlation between ozone susceptibility and stomatal aperture was not significant; there was no significant correlation between the ozone susceptibility and nitrogen content of leaves either. A high correlation, however, was noticed between the ozone susceptibility and the sugar content of leaves.

52668 **APTIC NO. 74755**

Sugiura, Kimiaki

ENVIRONMENTAL POLLUTION BY AUTOMOBILES. I. QUANTITATIVE DETERMINATION OF HEAVY METALS IN EACH ANNUAL GROWTH RING IN TREES PLANTED BY CAR ROADS. *(Jidosha ni yoru kankyo osen sono. I. Shadowaki jumoku no nenrinbetsu jukinzoku teiryo bunseki). Text in Japanese. Preprint, Japan Society for General Research, Tokyo, Environmental Science Div., p. 138-139, 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Heavy metal levels in annual growth rings of trees growing along roads were measured with atomic absorption spectrophotometry. Trunks of Japanese cypress cut down in August 1973 and January 74 were used as samples. The distances of the growth sites from the road were 1.0, 11.9, and 500 m. The ages of the trees were 57, 54, and 55 yr. The trees were located at the starting point of Otarumi Road in Tokyo. The lead content of trees located 1.0 and 11.9 m from the road increased between 1955 and 65 and then gradually decreased until 1971. This trend was similar to the number of cars that passed over the starting point of the road. Lead levels in trees located 11.9 m from the road were much less than those in trees 1.0 m from the road. Thee lead content in trees 500 m from the road was too low to determine accurately. The contents of lead and cadmium in bark were also measured as a function of the distance of the trees from roads and clearly showed the effect of pollution by automobile exhausts.

52669 **APTIC NO. 74467**

Suzuki, Y., N. Fujii, and H. Yano

ON THE CHROMIUM CONTENT OF LEAVES OF CRYPTOMERIA JAPONICA AROUND A CHROMATE MANUFACTURING FACTORY. *(Bo kuromusan seizo kojo shuhen ni okeru sugi-yo chu kuromu ni tsuite). Text in Japanese. Shikoku Koshueisei Gakkai Zasshi (J. Shikoku Soc. Public Health), 20(1):86-87, Feb. 1975. 3 refs.*

As an indicator of environmental pollution by chromium, the chromium content of leaves of Cryptomeria Japonica was determined yearly after 3 yr around a chromic acid manufacturing plant (production of 25,000 tons/yr). As the distance from the factory decreased the chromium content of leaves was larger. On the average 126.2, 68.9, and 17.9 micrograms of chromium/g of dry leaf in 1972, 1973, and 1974, respectively, were measured within 500 m of the factory; 13.7, 11.4, and 5.7 micrograms of chromium/g of dry leaf were measured in 1972, 1973, and 1974, respectively, within 500-1000 m of the factory; 3.1, 1.7, and 1.8 micrograms of chromium/g of dry leaf were measured in 1972, 1973, and 1974, respectively, at more than 2 km from the factory. The chromium content showed a decreasing trend annually; environmental pollution also decreased, especially during 1973 to 1974.

52670 **APTIC NO. 74864**

Tanibuchi, M. and Y. Usui

RESULTS OF INVESTIGATION ON THE EFFECTS OF AIR POLLUTION ON TREES. *(Taikiosen no jumoku ni oyobosu eikyo chosa). Text in Japanese. Tokushima-ken ringyo shikenjo kenkyu hokokusho (Tokushima Prefect. For. Exp. Sta.), no. 13:36-52, March 1975. 4 refs.*

The results of 3 yr of investigation starting in 1971 on the effects of sulfur oxides on trees in 10 forests around the Tokushima power station are described in terms of the declining state of the trees, the concentration of sulfur dioxide in the air, and the sulfur content of the leaves. No relationship was observed between the index of tree decline and air pollution. No symptoms appeared on tree leaves which were attributable to air pollution. The concentration of sulfur dioxide in the air showed a decreasing tendency in areas near the station. The correlation between the concentration of airborne sulfur dioxide and the sulfur content of leaves was highest for Pinus densiflora.

52671 **APTIC NO. 74495**

Totsuka, I.

ON THE EFFECTS OF SULFUR DIOXIDE ON PHOTOSYNTHETIC FUNCTION OF HIGHER PLANT VEGETATION. *(Koto shokubutsu no gunraku kogosei kino ni oyobosu arysan gas no eikyo ni tsuite). Text in Japanese. Preprint, Japan Society for General Research, p. 77-78, 1975. (Presented at the Japan Society for General Research, Environmental Science Division Meeting, Tokyo, Japan, June 6-8, 1975.)*

The leaves of higher plants such as Amaranthus patulus were exposed to sulfur dioxide to determine the relationship between sulfur dioxide concentration and photosynthetic activity. The effect of sulfur dioxide on photosynthetic activity was assessed by examining the leaf area index, light absorbing coefficient, and light conditions. An approximate equation was obtained which represents the change of the photosynthetic ability of a single leaf of Amaranthus patulus as a function of exposure time to sulfur dioxide. From the photosynthetic inhibitory rate, concentration of sulfur dioxide, and illuminance, another approximate equation was derived which represents the photosynthetic ability of higher plants injured by sulfur dioxide.

52672 **APTIC NO. 74721**

Yamamoto, Takeo, Yasunobu Suketa, Eiichi Mikami, and Yoshimi Sato

ENVIRONMENTAL EVALUATION OF AIR POLLUTION BY FLUORIDE UTILIZING PLANT INDICATOR. *(Shokubutsu shihyo ni yoru kichu fukkabutsu osen no kankyo hyoka). Text in Japanese. Nihon Nogeikagaku Kaishi (J. Agr. Chem. Soc., Japan), 49(7):347-352, July 1975.*

Using leaves of gladiolus gandavensis and Citrus unshu as plant indicators for fluoride in air, the relation between fluoride accumulation in plants and air pollution by fluoride, especially fluoride in the gaseous state, was examined. The relationship between fluoride accumulation and particulate fluoride was also investigated. There was a good correlation between airborne fluoride and fluoride content of the plant leaves. A relationship was also found between the logarithm of fluoride content of leaves and the distance of the plant from the pollutant source. The injury was caused only by particulate fluorides. The average fluoride particle size was about 1.5 micron.

52673 **APTIC NO. 74312**

Yamamoto, Yoshitada

STUDIES ON WEATHER FLECK OF TOBACCO PLANTS. PART 18. GENETICOSTATISTICAL CONSIDERATION OF RESISTANCE OF TOBACCO PLANTS AGAINST WEATHER FLECK. *(Tobacco no seiriteki-hantenbyo ni kanseru kenkyu dai 18-ho. seiriteki-hantenbyo ni taisuru teikosei no tokei-idengaku teki kosatsu). Text in Japanese. Okayama Tabaco Shikenjo Hokoku (Bull. Okayama Tob. Exp. Stn.), no. 35:67-74, March 1975. 27 refs.*

The first two generations (and their backcrosses) of a tobacco strain susceptible to weather fleck (Bel W3) and a strain resistant to weather fleck (Connecticut 7-D) were examined in field cultures and pot cultures. The ozone susceptibility of these experimental plants was examined at their seedling stage. The degree of morbidity was represented by injured area of leaves and dimension and density of lesions. Only the additive effect of genes was significant in plants grown in fields; however, in potted plants and in seedlings the dominant effect was recognized on resistant plants and all epistasis effects were significant. The number of effective gene groups were small in every case, and the number of genes related to resistance was presumed to be relatively small. The genetic resistance of the second generation plants was greatest during field growing and least during the seedling stage.

52674 **APTIC NO. 74325**

National Forestry Experiment Station (Japan)

ACTUAL CONDITIONS OF DAMAGE TO AGRICULTURAL AND FORESTRY PRODUCTS DUE TO AIR POLLUTION. *(Norin sakumotsu-higai no jittai). Text in Japanese. Kankyo Eisei (Environmental Sanitation), 22(3):9-14, March 1975.*

The vigor and the sulfur content of leaves from several species of trees in the Tokyo area were investigated to assess the relationship between the two factors and to determine whether the leaf sulfur content indicates the degree of air pollution. The sulfur content of leaves of Pinus densiflora and Cryptomeria japonica, although showing age and seasonal differences, was greater in places where air pollution was higher, and the relationship was represented by a linear regression formula. The same tendency existed for Zelkova serrata. The content of water-soluble inorganic sulfur showed a closer relationship to air pollution, and in the peak season it amounted to 65% of the total leaf sulfur in polluted areas. Maximum sulfur values of leaves appeared to indicate the extent of damage due to air pollution.

52675 **APTIC NO. 74328**

Kanto Regional Headquarters for Promoting Countermeasures to Public Nuisance (Japan), Section of Air Pollution

RELATION BETWEEN PLANT DAMAGES AND PHOTOCHEMICAL OXIDANT. *(Shokubutsu-higai to oxidant tono kankei). Text in Japanese. In: Report On The Influences Of Photochemical Smog On Plants, 1974. p. 34-51, March 1975.*

Photochemical oxidant air pollution as represented by the times when oxidant alarms were officially announced occurred 14-21 times in four prefectures of South Kanto and one to nine times in three prefectures of North Kanto in 1974. According to the number of days when more than 10 pphm of oxidant was measured, the oxidant seemed to be concentrated in the middle of Saitama Prefecture from July to August, without concentrating in southern prefectures. The distribution of pollutant (oxidant) leaned to the east side of Kanto as did that of plant damage which appeared on the day of the occurrence of photochemical smog. However, the distribution of cumulative damage to plants coincided with the distribution of oxidant. No clearcut relationship was found between the degree of plant damage and oxidant concentration. The peak oxidant concentration appeared earlier in the morning in South Kanto and several hours later in North Kanto. Damage was heavier in South Kanto where the oxidant concentration was relatively low compared to the oxidant concentration in North Kanto.

52676 **APTIC NO. 74329**

Kanto Regional Headquarters for Promoting Countermeasures to Public Nuisance (Japan), Section of Air Pollution

CIRCUMSTANCES OF OCCURRENCE OF PLANT DAMAGE DUE TO PHOTOCHEMICAL OXIDANT. *(Oxidant ni yoru shokubutsu higai no hassei jokyo). Text in Japanese. In: Report On The Influences Of Photochemical Smog On Plants, 1974. p. 20-33, March 1975.*

Investigations of plant damage due to photochemical smog were carried out in July and August of 1974 on 24 species at 78 points distributed over the Kanto region. The distribution of plant damage was represented by species of dasheen and morning glory, with the damaged leaf area being classified into four classes from 0 to 3. During one investigation, direct damage to both plants was the same and was distributed from northeast to southwest in Kanto, making an eliptic pattern. Cumulative damage covered almost all the area. During a second investigation, the damage of dasheen was less than that of morning glory, with the latter covering all of the area and the former appearing only in south Kanto. The susceptibility of plants to photochemical oxidants decreased in the order of morning glory and dasheen, peanut and maize, and Welsh onion and chard during the first investigation; and morning glory, peanut and dasheen, chard, maize, and Welsh onion during the second investigation. The plants which showed established damage in the two investigations were 19 species including leaf and root crops, cereals, and ornamental plants. Direct damage (due to photochemical smog on the day prior) appeared on dasheen, Welsh onion, peanut, soya bean, spinach, chinese cabbage, morning glory, radish, a salting green, carrot, tobacco, and rice. On many plants the ratio of the average damaged leaf area to total leaf area corresponded to the degree of damage fairly well, suggesting that the ratio is a preferable index of quantifying the damage of plants due to photochemical oxidants.

52677 **APTIC NO. 74330**

Kanto Regional Headquarters for Promoting Countermeasures to Public Nuisance (Japan), Section of Air Pollution

SYMPTOMS OF PLANTS AFFECTED BY PHOTOCHEMICAL SMOG (OXIDANT). *(Oxidant ni yoru shokubutsu higai shojo). Text in Japanese. In: Report On The Influences Of Photochemical Smog On Plants, 1974. p. 8-19, March 1975. 4 refs.*

The results of investigations in the Kanto region in 1974 on plant damage by photochemical smog were tabulated in terms of plant species, number of plants observed, positions of injury, necrosis, chlorosis, color of spots, and types of injury. The plants were mostly vegetables, cereal crops, and ornamental herbs. Injuries appeared in many plants on the interveinal leaf surface and later on the entire leaf surface. Only the periphery of leaves was affected in fewer instances. Necrosis was seen on dasheen leaves along the vein more frequent than was chlorosis. Chlorosis was more predominant than necrosis in morning glory, peanut, Chinese cabbage, and radish. Both symptoms were observed for maize, Welsh onion, rice, spinach, and chard. Spots on leaves appeared on many leafy vegetables and tobacco. Irregular lesions appeared on dasheen, maize, spinach, Japanese radish, radish, and petunia. The symptoms also appeared on the underside of the leaves of 10 species, especially petunia and salting green (komatsuna). The distribution of damaged plants in a field was almost uniform, and the degree was nearly 100%. Characteristic features of symptoms on the underside of leaves due to peroxyacyl nitrates were lustering, bronzing, and silvering, with attack of leaf parenchymatus cells near stomata. Color photographs showed the status of the symptoms.

52678 **APTIC NO. 74674**

Saitama Prefectural Office (Japan), Section of Horticulture and Agriculture

STATES OF PLANT DAMAGE DUE TO PHOTOCHEMICAL SMOG. *(Shokubutsu higai jokyo). Text in Japanese. In: Development and Countermeasures of Occurrence of Photochemical Nuisance in Saitama Prefecture. p. 40-49, March 1975.*

Plant damage was investigated in Saitama Prefecture which experienced 29 cases of photochemical smog during 1974 as compared to 45 cases for the previous year. Vegetable damage was investigated at 12 fields in the prefecture from the middle of June to early in September. Plants which showed injuries were morning glory, radish, peanut, Chinese cabbage, spinach, and Japanese radish. The locality of plant damage was assessed from injury to the most susceptible plants such as morning glory and radish. Investigations in the southern part of the prefecture showed that agricultural crop damage attributable to photochemical smog was a little less than usual; however, damage to spinach and radish was severe. Damage to taro (Colocassia esculenta) was also severe, but it was not attributed to photochemical smog only. Cryptomeria japonica became more susceptible to air pollution as the plant aged, especially at roadside and factory sites.

52679 **APTIC NO. 74693**

Kanagawa Prefectural Bureau of Countermeasures for Environmental Pollution (Japan) and Kanagawa Prefectural General Inst. of Agriculture (Japan)

LOCAL EVALUATION OF AIR POLLUTION BY REMOTE SENSING. *(Remote sensing ni yoru taikiosen no chiiki hyoka). Text in Japanese. (Kanagawa-ken taiki osen chosa kenkyu hokoku (Rep. Invest. Res. Air Pollut., Kanagawa Prefect.), no. 17:88-102, Feb. 1975.*

Air pollution in Kanagawa Prefecture was studied by examining the relationship between tree vitality (on the ground) and the density distribution of trees as remotely measured with an aerial multiband camera. There was a close relationship between tree vitality and air pollution; a positive significant correlation existed between the density determination of trees obtained by remote sensing and the vitality of trees. The best time for photographing the trees by multiband camera was August.

52680 **APTIC NO. 74922**

Hiroshima Prefectural Agricultural Experimental Station (Japan), Dept. of Soil and Fertilizers

RESULTS OF INVESTIGATION OF CROP DAMAGE DUE TO AIR POLLUTION. *(Taikiosen busshitsu ni yoru nosakumotsu higai chosa). Text in Japanese. In: The 1974 Business Report of the Hiroshima Prefectural Agricultural Experimental Station. p. 22-23, June 1975.*

Observation fields were established in six places in Hiroshima Prefecture; and predetermined crops such as buckwheat, radish, spinach, lettuce, and Beta vulgaris were grown. Early in July, white spots appeared on leaves of radish, spinach, Welsh onion, and Colocasia antiguorum in Otake, Hiroshima, Kure, and Fukuyama; however, no such symptoms appeared on lettuce and B.v. at these places. No symptoms were observed at other places, such as Mikara and Higashi-hiroshima. Chlorotic damage to leaves of Japanese radish and carrot in Fukuyama was attributed not to air pollution but to the high ambient temperature, abnormally high tide, high salt content of the soil, and their complex interactive effects because no chlorosis appeared on radish which is sensitive to oxidants.

52681 **APTIC NO. 74923**

Kanagawa Prefectural Forestry Experiment Station (Japan)

ON THE INFLUENCE OF AIR POLLUTION ON TREES (RESULTS OF INVESTIGATION). *(Taikiosen no jumoku ni oyobosu eikyo ni tsuite, jittai chosa). Text in Japanese. Kanagawa-ken taiki osen chosa Kenkyu Hokoku (Rep. Invest. Res. Air Pollut., Kanagawa Prefect.), no. 17:109-117, Feb. 1975.*

The effects of air pollution on the tree species Ginkgo biloba and Pasania edulis were examined at six parks in coastal and inland industrial areas of Kawasaki. Although these two species were relatively resistant to air pollution and grew in large numbers, they were nevertheless affected by air pollution. The sulfur content of the leaves, especially for G.b., showed a close relationship to the concentration of sulfur dioxide in the air. A maximal value of 1.3% was measured.

52682 **APTIC NO. 76660**

STUDIES ON CIRCULATION OF POLLUTANTS IN ECOSYSTEM OF AGRICULTURE, FORESTRY AND FISHERY AND ON LIVING INDEX OF POLLUTANTS. SUBTHEME II. TOLERANCE LIMIT OF LIVING INDEX IN ENVIRONMENT OF AGRICTULTURE FORESTRY, AND FISHERY, AND THE UTILIZATION OF LIVING INDEX ON LAND. *(Norin suisan seitai kei no okeru osen busshitsu no junkan to shihyoseibutsu ni kansuru kenkyu. Subtheme II. Norin suisan kankyo ni okeru shihyoseibutsu no taiseigenkai to sono riyo). Text in Japanese. PPM (Japan), 6(8):86-88, Aug. 1975.*

Damage to microbes, lichens, mosses, herbs, trees, insects, and small animals was studied as a index of pollution. A tolerance limit and susceptibility index were established. Indicators for ozone, sulfur dioxide, automobile exhaust, and nitrogen dioxide were studied. The effect of ethylene on morning glory and Prunus mume and the susceptibility of various trees to ethylene were also studied. Rice plant was used as an indicator of ozone.

1974

52683 APTIC NO. 76687

Anderson, Steve, Bernard Bormann, Bruce Caldwell, Bob Denison, Lindell Eldred, and Cindy Swanberg

THE EFFECTS OF ACID RAIN ON NITROGEN FIXATION IN WESTERN WASHINGTON CONIFEROUS FORESTS (FINAL TECHNICAL REPORT). *Evergreen State College, Olympia, Wash., National Science Foundation Grant GY-11470, 38p., Aug. 30, 1974. 31 refs.*

The effect of acid rain on nitrogen fixation in western Washington coniferous forests was studied at three sampling locations. Acid rain showed little effect on nitrogen fixation in coniferous forest soils due to pH buffering by the canopy. Nitrogen fixing lichens and bacteria in the canopy itself were also investigated. The epiphytic lichen Lobaria oregana fixed substantially more nitrogen than did soil microorganisms in old-growth forests. In commercial forests, however, trees are harvested at an age less than that at which this lichen develops in any abundance. Rain samples showed a weighted mean pH of 4.97 and ranged from 4.3-5.8, indicating that rain in the area is no longer under carbonic acid control. A scheme involving the reaction of sulfur dioxide with water which produces sulfurous acid which then reacts with atmospheric oxygen to give sulfuric acid is proposed to account for the increased rain acidity. (Author abstract modified)

52684 APTIC NO. 74466

Arai and Imai

STUDIES ON PLANTING TREES IN A SMOKE-POLLUTED AREA. ON THE ACTUAL STATE OF DAMAGE OF TREES DUE TO AIR POLLUTION IN IWAKI AREA. *(Engai-chi no ryokka ni kansuru kenkyu - Iwaki-chiku no taikiosen ga jumoku ni ataete iru higai no jittai ni tsuite). Text in Japanese. Fukushima-Ken Ringyo Shikenjo Hokoku (Rept. Fukushima Prefect. For. Exp. Stn.), no. 6:38-39, Dec. 1974.*

Damage to trees in the Iwaki area, ranging from slight growth suppression to changes in leaf color, leaf-fall, and withering, was examined in relation to industrial sulfur oxide emissions. A survey of local conditions, amount of tree growth, index of damage, and the sulfur content of leaves from each of 20 pine trees (Pinus densiflora) 10-20 yr old was performed. There was a positive logarithmic relationship between the elongation of new twigs and the distance from the smoke source. Generally, the vigor of trees was higher, the greater the distance from the smoke source, with some exceptions suggesting the effect of topography. Sulfur content showed the same inverse tendency with some exceptions, and it was lower than that determined previously. The sulfur content of leaves of Quercus serrata was one and a half to two times greater than that of P. densiflora.

52685 APTIC NO. 74551

Asakawa, Fumiyuki, Tamao Imai, and Syozi Kusaka

INFLUENCE OF OZONE ON AGRICULTURAL CROPS. PART 1. THE RELATIONSHIP BETWEEN THEIR VISIBLE INJURIES AND CONCENTRATION AND PERIOD OF OZONE EXPOSURE, AND THE EFFECTS OF OZONE ON CARBOHYDRATES AND CHLOROPHYLL. *(Nosakumotsu ni oyobosu ozon no eikyo dai 1 ho, kashigai to nodo, jikan no kankei ohobi toshitsu, kurorofilu eno eikyo). Text in Japanese. Kinki-Chugoku Nogyo Kenkyu (Agric. Res. Ninki Chugoku), no. 48:82-86, June 1974. 22 refs.*

Potted tomato plants were exposed to ozone at concentrations of 0.1, 0.2, 0.5 and 1.0 ppm for 10, 5, 2 and 1 hr, respectively. Other potted tomato plants were exposed to ozone at 0.1 and 0.2 ppm for periods of 5, 10, 15, 20 and 25 hrs. Both exposures were carried out in a natural light, controlled weather chamber for 5 hr/day at 25 C and a relative humidity of 75%. Plant injuries were assessed the day after the completion of exposure. Ozone susceptibility was highest in leaves of middle position growing vigorously. Symptoms at lower concentrations consisted of white splashed patterns and dark brown spots; those at higher concentrations consisted of a scorched greyish-brown discoloration along the costa of leaves. The degree of visible damage was higher for shorter exposures at higher concentrations, suggesting a proportionality of exposure time to the square of the reciprocal of concentration. At the first stage of visible damage, an increase of reducing carbohydrates and a decrease of starch were noticed and appeared to be related to the visible injuries. After slight exposure which resulted in no visible injuries both reducing carbohydrates and starch tended to decrease. Chlorophyll in leaves exposed to ozone decreased as compared to control levels.

52686 APTIC NO. 74724

Date, N. and T. Yoneyama

ANALYSIS AND COUNTERMEASURES OF PHOTOCHEMICAL SMOG DAMAGE OF HORTICULTURAL PLANTS. 1. INVESTIGATION OF DISTRIBUTION OF OXIDANT DAMAGE OF VEGETABLES IN TOKYO METROPOLIS. *(Engeishokubutsu no kokagaku smog higai no kaiseki to taisaku. 1. Tonai ni okeru yasairui no oxidant higai bunpu chosa). Text in Japanese. In: Interim Report of Developing Indicator Plant Group. Tokyo Agricultural Experimental Station (Japan), p. 43-57, Sept. 1974.*

In 39 vegetable fields in Tokyo, eight species of oxidant-susceptible vegetables (spinach, Beta vulgaris, Colocasia esculenta, Welsh onion, maize, a salting green, Chinese cabbage, and Japanese radish) were surveyed as to oxidant damage during June 26 to July 2 and July 19 to 28. During these periods serious damage was observed. Two types of damages were observed. Dehydrated and bleached spots on B.v. and spinach leaves (developed into necrosis) were attributed to ozone; brown and shiny spots on the underside of leaves was attributed to peroxyacetyl nitrate. Brown spots (developing to necrosis) on leaves of C.e. were attributed to ozone. Bleached apex, scorching, and wilting of Japanese onion were also attributed to ozone as were chlorosis and bleached spots (developing to necrosis) on leaves of maize.

52687 APTIC NO. 74350

Furukawa, A., M. Kadota, and K. Furukawa

EFFECTS ON PHOTOSYNTHESIS AND RESPIRATION OF POPLAR EXPOSED TO OZONE. *(Pobura no kogosei kokyu ni oyobosu O3 no eikyo). Text in Japanese. Preprint, Japan Society of Forestry, Tokyo, p. 3-4, 1974. (Presented at the Japan Society of Forestry, Central Japan Lecture Meeting, 23rd, Nagano, Oct. 20, 1974.)*

Poplar leaves separately exposed to 0.9 ppm ozone for 90 min showed a remarkable decrease in photosynthesis rate. The degree of the disturbance was higherr in mature than in younger leaves. An exposure at 0.5 ppm ozone for 30 min caused no disturbance in leaves of all stages, but the photosynthesis rate in mature leaves decreased by about 20% after exposure to ozone at 1.0 ppm for 30 min. Plant respiration rate inn the dark was increased and that in the light was decreased after exposure to ozone at 0.9 ppm for 90 min. The conpensation point increased from 0.8 Klux to 1.2 Klux for the above treatment.

52688 APTIC NO. 74723

Hatta, H. and K. Terakado

DAMAGE OF MORNING GLORY BY PHOTOCHEMICAL OXIDANT AND THE APPROPRIATENESS OF THE DAMAGE AS INDEX OF OXIDANT. *(Oxidant ni yoru asagao no higai to sono shishyosei ni tsuite). Text in Japanese. In: Interim Report Of Developing Indicator Plant Group. Tokyo Agricultural Experimental Station (Japan), p. 13-31, Sept. 1974. 21 refs.*

Experiments were carried out to examine the appropriateness of morning glory as a plant indicator of photochemical oxidants. Damage to morning glory was confirmed by environmental exposure and comparison with plants grown in a clean air chamber. The damage consisted of chlorosis and necrosis, the latter being due to exposure at higher concentrations of oxidant. A high correlation was seen between the damage index of plant leaves and the cumulative value of oxidant. Several hr of exposure to more than 8 pphm of oxidant caused damage. The damage appeared on leaves whose development had stopped and coincided with the stomata of apertures. The number of developed leaves, dry weight, and leaf area of exposed plants were inferior to those of plants not exposed as were the chlorophyll content, sugar, and starch content of the leaves. In the summer new leaves developed at the rate of one-two/day; therefore, it was possible to observe oxidant damage over successive days. The total degree of damage was assessed by surveying five leaves from the top of each plant.

52689 **APTIC NO. 76715**

Honing, Frederick W. and Robert C. Loomis

THE IMPACT OF AIR POLLUTION ON THE FOREST RESOURCE. *Preprint, Forest Service, Atlanta, Ga., Environmental Quality Evaluation Group, 13p., 1974 (?). 6 refs.*

The effects of air pollutants such as fluorides, sulfur dioxide, and ozone on forest vegetation are reviewed. Fluorides are significant because hydrogen fluoride is toxic to some plants at extremely low concentrations. Fluorides can enter leaves through the stomata and can also be absorbed through the leaf surface. The characteristic symptom of acute fluoride injury on many broad-leaved plant species is necrosis which occurs predominantly at the leaf tips and margins. The characteristic symptom of acute SO2 injury to broad-leaved plants is an inter-veinal necrosis. These areas of dead leaf tissue first have a water-soaked appearance and take on a bleached ivory color in most plant species upon drying. Ozone probably causes more injury to vegetation than any other air pollutant in the United States. In contrast to SO2 and fluoride injury, plant injury due to photochemical oxidants is often found many miles from industrial or urban sources. Ozone injuries are of four general types: pigmented lesions, upper-surface or either-surface bleaching, bifacial necrosis, and chlorosis.

52690 **APTIC NO. 74726**

Iijima, T.

INDEX PROPERTIES OF SEVERAL AGRICULTURAL CROPS AS TO PHOTOCHEMICAL OXIDANT. *(Sushu nosakubutsu no kokagaku oxidant shihyosei). Text in Japanese. In: Interim Report Of Developing Indicator Plant Group. Tokyo Agricultural Experimental Station (Japan), p. 32-42, Sept. 1974.*

Agricultural crop plants of 13 families, including 25 species and 53 varieties, were grown in fields and exposure chambers to examine the characteristics of oxidant damage and appropriateness of the plants as indicators of oxidant. Oxidant damage appeared on 20 species of 12 families. Radish, French bean, lucerne, and maize were appropriate as ozone indicators, and Beta vulgaris was a good peroxyacetyl nitrate indicator. Oxidant damage was apt to appear on mature leaves that were still developing. Damage to radish appeared at 8 pphm of oxidant for more than 4 hr exposure. Light bleach spots and severe damage to radish appeared at the thresholds oxidant value of 45 pphm/hr.

52691 **APTIC NO. 74493**

Imamura, Suburo, Hideo Okino, and Ikuo Inagaki

A CASE OF CABBAGE QUALITY DAMAGE DUE TO DUSTFALL FROM A THERMAL POWER STATION. *(Karyoku-hatsudensho funjin ni yoru kanran no higai). Text in Japanese. Aichi-ken Nogyo Sogo Shikenjo Kenkyu Hokoku (Rept. Stud. Aichi Prefect. Gen. Agric. Exp. Stn.), no. 6B:102-107, Oct. 1974. 8 refs.*

A case of black spot on the leaf surface of cabbages grown near a thermal power station in the Atsumi district of Aichi Prefecture in January 1973 is reported. The spots had a diameter of 1.0-1.5 mm. The plant damage appeared as far as 10 km from the station and was especially severe in areas leeward of the station. The degree of damage showed a relationship to the distance from the station. Microscopically, there were two kinds of spots; one type consisted of purple-black and dark green rings with light-brown cracks; the other type contained microdusts in the center. Dusts collected from the power station produced spots on leaves of cabbage, lettuce, Chinese cabbage, Chenopodium album and Erigeron bonariensis which were almost the same in appearance as those observed on cabbage leaf surfaces in January 1973. The damage was attributed to dustfall from the power station.

52692 **APTIC NO. 74463**

Kato, T., S. Tachibana, and T. Inden

STUDIES ON THE INJURIES OF CROPS BY HARMFUL GASES UNDER COVERING. PART 2. ON THE MECHANISM OF CROP INJURY DUE TO GASEOUS NITROGEN DIOXIDE. *(Hifuku-ka ni okeru yugai gasu ni yoru sakumotsu no shogai ni hansuru kenkyu II. Ashosan-gasu ni yoru sakumotsu no shogai no kisa ni tsuite). Text in Japanese. Seibutsu Kankyo Chosetsu (Environ. Control Biol.), 12(4):103-107, Dec. 1974. 9 refs.*

The mechanism of crop injury by nitrogen dioxide gas was investigated by exploring kidney bean, cucumber, tomato, egg plant, and spinach plants 6.0 - 17 ppm NO2 under various conditions. The application of aqueous oxyethylene decasanol on crop leaves reduced the injury due to the gas, expecially on the lower leaf sides. Leaves exposed to NO2 in the dark showed severer injury and contained more nitrite anion than those exposed to NO2 in the light. Leaves smeared with an aqueous sodium nitrite solution showed the same type of injury as that induced by NO2. After treatment with 3-(3,4-dichlorophenyl)-1,1- dimethylurea, the leaves became more susceptible to the gas even under light and formed more nitrite anion than controls. Plants grown in nitrate-nitrogen cultures were less susceptible to NO2 damage than those grown in ammonia-nitrogen cultures or cultures without nitrogen and contained less nitrite anion than others. Plant injury by gaseous nitrogen dioxide appeared to be caused by nitrite anion. Susceptibility to NO2 depended on the amount of the gas taken in by stomata and on the physiological activity of the plant which reduces the anion. The reduction is carried out by nitrite reductase; that the photochemical reduction by reductase in chloroplasts appears to be related to the injury-reducing effect of light.

52693 **APTIC NO. 74464**

Kato, T., S. Tachibana, and T. Inden

STUDIES ON THE INJURIES OF CROPS BY HARMFUL GASES UNDER COVERING. PART 1. INJURIES OF VEGETABLES BY GASEOUS NITROGEN DIOXIDE AND THE CONDITIONS AFFECTING CROP SUSCEPTIBILITY. *(Hifuku-ka ni okeru yugai gasu ni yoru sakumotsu no shogai ni kansuru kenkyu. I. Ashosan-gasu ni yoru sosai no shogai to sono kanjusei ni eikyo suru shojoken). Text in Japanese. Seibutsu Kenkyo Chosetsu (Environ. Control Biol.), 12(3):87-92, Sept. 1974. 9 refs.*

The effects of environmental conditions such as soil-moisture humidity, and light on injuries to crops such as kidney bean, cucumber, tomato, and egg plant as well as the relationships between injury occurrence and plant nutrition, age of seedlings, and leaf position were investigated when the crops were exposed to gaseous nitrogen dioxide under a covering. The injury was severer when the soil moisture was richer and the humidity was higher. Injury was greater under dark conditions as opposed to light conditions before, during, and after NO2 exposure. The first leaves of kidney bean plants were more susceptible to the gas when they were younger. Leaves with active metabolism (in the middle position) were the most susceptible to NO2. Vegetables grown in fields or cultures poor in nitrogen were apparently susceptible to the gas, and those grown in ammonia-nitrogen rich cultures were more severely injured than those grown on nitrate-nitrogen rich cultures. Those grown in iron-deficient cultures were more susceptible to NO2 than controls.

52694 **APTIC NO. 74462**

Oe, Masaharu and Kaneo Mega

STUDIES ON THE EFFECTS OF AIR POLLUTION ON CROPS. PART 2. THE EFFECTS OF CONDITIONS OF FERTILIZATION ON GROWTH AND SUSCEPTIBILITY OF GARLAND CHRYSANTHEMUM TO OZONE. *(Nosakumotsu no taiki-osen ni kansuru kenkyu (2) Sehijoken ga shungiku no seicho narabini ozon kanjusei ni oyobosu eikyo). Text in Japanese. Osaka-fu Noringijutsu Center Kenkyu Hokoku (Bull. Osaka Prefect. Agric. Res. Cent.), no. 11:159-164, June 1974. 2 refs.*

The effect of fertilization on the growth and susceptibility to ozone (0.4 ppm for 6 hr during the growing stage) of Garland chrysantheumum potted and placed in a glass house was studied. An increase in nitrogen fertilization resulted in growth promotion; however, excessive application of nitrogen resulted in inhibition of growth and stiffness of leaves. The effect of phosphorus fertilization was small; excessive application of potassium resulted in severe stiffness of leaves, the effect of fertilization on plant injury due to ozone was not very great; however, an increase in nitrogen or potassium fertilization caused a decrease in the number of damaged leaves. The excessive application of each of the fertilizers resulted in greater decreases in damage due to ozone. Crops highly fertilized were stiff in appearance with a less marketable value, in spite of their tenacity to ozone.

52695 **APTIC NO. 74494**

Okino, Hideo, Saburo Imamura, and Ikuo Inagaki

DUST STAIN OF PEAR FRUITS DUE TO POLLUTANTS FROM A FOUNDRY. *(Imono-Kojo no funjin ni yoru nashi-kajitsu no osen). Text in Japanese. Aichi-ken Nogyo Sogo Shikenjo Kenkyu Hokoku (Rept. Stud. Aichi Prefect. Gen. Agric. Exp. Stn.), no. 6B:108-112, Oct. 1974. 9 refs.*

Studies to ascertain the cause of stains on pear fruits found in Nishio, Japan in September 1972 were conducted. The studies consisted of a survey of leaves, fruits, and twigs of pears grown near and remote from a foundry, an analysis of dusts collected from the foundry, and the determination of iron and manganese in pear fruits collected at several points. The leaves of plants near the foundry were moderately black in color. The iron and manganese contents of polluted fruits and leaves were greater (1.76 mg of iron/1000 sq cm of surface) than those of plants grown in unpolluted areas. Sulfur levels of polluted and unpolluted leaves were the same. The dust collected in the foundry contained iron as well as manganese, chromium, nickel, copper, and zinc. The pollution damage to pear fruits appeared to be due to dustfall from the foundry.

52696 **APTIC NO. 76714**

Rosen, Judith A., Warren L. Capps, Mary E. Enama, Steven P. Jakubowics, Robert C. Kochel, Kristene E. Whitmore, and Bruce P. Wicherski

ENVIRONMENTAL ZINC CONTAMINATION AND PLANT TOXICITY. *Preprint, Franklin and Marshall Coll., Lancaster, Pa., 197p., Aug. 21, 1974. 147 refs.*

Environmental zinc contamination is discussed in terms of its toxicity to plants. Topics covered include: industrial and nonindustrial sources of zinc pollution; edaphic and physiological parameters of zinc toxicity in plants; zinc tolerance in plants; field and laboratory studies of the physiological and biochemical parameters of zinc toxicity, including the zinc-iron interaction in zinc-toxic plants, the analysis of intermediates of chlorophyll biosynthesis from zinc-induced chlorotic plants, and the subcellular determination of zinc and iron distribution in zinc-toxic plants; the effect of sewer sludge application on zinc uptake by garden vegetables and its accumulation in the soil; and liming as a curative practice for zinc-contaminated soils.

52697 **APTIC NO. 74364**

Sawada, T.

PHOTOCHEMICAL SMOG AND PLANTS. *(Kokagaku sumoggu to shokubutsu). Text in Japanese. Shokubutsu Shunju (Plant Growth), no. 149:1048-1049, July 1974.*

Surveys of plant damage due to photochemical smog are summarized. The components of smog which appear to be responsible for plant damage include ozone and peroxyacyl nitrates. Their phytotoxic effects are much greater than those due to sulfur oxides. Damage surveys since 1970 reveal the following symptoms appearing on herbaceous plants (morning glory, cocks comb, dahlia, knotweed, petunia, chickweed, Welsh onion, spinach, Chinese cabbage, chard, taro): yellowish-white leaf discoloration, white and brown spots on matured leaves, and silvering of the lower surfaces of young leaves. Symptoms which appear on arboraceous plants such as zelkova, poplar, ginkgo, planetree, rose mallow, magnolia, pine tree, and rhododendron include early yellowing and reddening, white or brown spots, and untimely leaf-fall. The above plants are now utilized as indicator plants of photochemical smog. Surveys covering a broad area of Tokyo and three other prefectures indicate that plant damage due to photochemical smog extends to relatively unpolluted areas.

52698 **APTIC NO. 74299**

Shinozaki, M.

ANALYSES OF PLANT INJURIES DUE TO HARMFUL GASES: PART I. SEC. B. EXPERIMENTS ON THE EFFECT OF OZONE ON CHARD AND CHINESE CABBAGE. *(Yugai gasu ni yoru shokubutsu higai no kaiseki (1)-b. fudan-so santosai no taisuru ozon no eikyo shiken). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect. Agr. Integr. Inst.), 1973:71-72, June 1974.*

Swiss chard was cultivated on four plots and exposed to 0.22-0.25 ppm of ozone for 9 hr/day. Half of each plot was treated with 0.2% aqueous piperonyl butoxide. Chinese cabbage which was treated with 0.2% aqueous piperonyl butoxide on the upper leaf surface, the lower leaf surface, or on both the upper and lower surfaces (control not treated) was exposed to ozone at dose of 140 pphm/hr for two consecutive days. The leaves of untreated chard showed bleach spots identical to those seen in fields damaged by photochemical smog. Piperonyl butoxide treatment reduced the damage. The leaves of untreated Chinese cabbage also showed bleach spots identical to those seen in fields damaged by photochemical smog. The protective effect of treating both surfaces of the leaves with piperonyl butoxide was greater than that resulting from treating only the surface. The resistance of Chinese cabbage was less than that of Swiss chard to ozone.

52699 **APTIC NO. 74725**

Terakado, K. and H. Hatta

ON THE PAN INJURY OF PETUNIA. *(Petunia no PAN gata higai ni tsuite). Text in Japanese. In: Interim Report Of Developing Indicator Plant Group. Tokyo Agricultural Experimental Station (Japan), p. 58-64, Sept. 1974.*

Intervarietal differences in peroxyacetyl nitrate injury to petunia was observed at 12 points and 15 times from 1973 to 1974. To confirm the observations, 10 varieties of petunia (seven to eight leaves) in field were examined in April of 1973. The most susceptible was White Ensign; Blue Ensign, was moderately susceptible, and Scarlet Ensign was relatively less susceptible. These varieties were tested in an environmental exposure room. The intervarietal differences in injury were conspicuous when the concentration of PAN increased from 0.6 ppb at nine o clock in the morning to 3.0 ppb at three o clock in the afternoon. The relationship between injury and leaf position depended on the variety. Injury by PAN concentrated on young leaves. Microscopically, browning and collapse of the spongy parenchyma on the lower leaf side was observed in slightly injured plants.

52700 **APTIC NO. 74903**

Ueshima, T., T. Ishii, and K. Nakajima

EXPERIMENTAL STUDIES ON MALODOR PREVENTION AS A POLLUTION COUNTERMEASURE IN HOG-RAISING. *(Yoton kogai taisaku to shite no akushu boshi shiken). Text in Japanese. Nihon Juishikai Zasshi (Japan J. Vet. Sci.), no. 27:718-720, Dec. 1974.*

Attempts were made by the addition of hydroxamic acid to hogfeed to decrease urease activity in hog feces. Urease causes decomposition of urea in hog urine to form large amounts of ammonia. Ninety-two pigs (average weight, 32 kg) were divided into three groups: a test group, control group, and a reversible group (comprised of test and control groups). The test group had 0.2% hydroxamic acid additive included in its feed for 5 wk. In the reversible group, a test group and control group were reversed at the end of 2 wk. Whenever hydroxamic acid was added to the diet, ammonia formation decreased, although the values fluctuated. Values of ammonia concentration as low as 0.02 ppm were obtained at the end of 2 wk from a group of pigs which had an ammonia concentration of 3.81 ppm before tests were begun.

52701 **APTIC NO. 74605**

Van Hook, R. I., Jr., B. G. Blaylock, E. A. Bondietti, C. W. Francis, J. W. Huckabee, D. E. Reichle, F. J. Sweeton, and J. P. Witherspoon

RADIOISOTOPE TECHNIQUES IN DELINEATION OF THE ENVIRONMENTAL BEHAVIOR OF CADMIUM. *Oak Ridge National Lab., Tenn., Environmental Sciences Div., National Science Foundation RANN Program and U. S. Atomic Energy Commission Contract, Rept. IAEA/SM-175/22, 1974. 28 refs.*

NTIS: CONF-730817-2

Radioisotope techniques which are being developed and utilized at Oak Ridge National Laboratory (ORNL) for the evaluation of the environmental behavior of toxic elements such as cadmium in aquatic and terrestrial ecosystems are described. Information on biogeochemical cycling and distribution of cadmium in the environment is provided by tracer techniques using cadmium-109 in microcosm, field plot, and stream systems. Parameters measured include adsorption capacity for cadmium in mineral soils and sediments; uptake rates of cadmium in various plant species from both soils and nutrient solutions as affected by pH; competing cations, and chemical form of cadmium; and distribution of cadmium in various components of both aquatic and terrestrial ecosystems following application of 109 cadmium to soil, vegetation, or streams. Food chain parameters estimated with 109 cadmium include uptake, assimilation, and turnover by both aquatic and terrestrial organisms. Insight into the behavior of cadmium in aquatic and terrestrial ecosystems, especially transport rates of cadmium and potential biomagnification or dilution in food chains, is provided by the information obtained in these radiotracer studies. The factors which influence the incorporation of cadmium into vegetative material as well as those affecting residence time in ecosystems have been identified. Use of 109 cadmium has permitted evaluation of a cadmium-specific electrode as a tool for rapid assay of free cadmium ions in soil solutions. (Author abstract modified)

52702 **APTIC NO. 74478**

Kanagawa Prefectural Office (Japan)

RESULTS OF INVESTIGATION ON THE EFFECTS OF AIR POLLUTION TO TREES. *(Jumoku ni oyobosu eikyo chosa). Text in Japanese. In: Kanagawa Prefectural Public Nuisance White Paper. p. 332-333, Dec. 1974.*

The effects of air pollution, especially sulfur oxides, on Ginkgo biloba and Pasania edulis in parks from the coastal to the inland part of Kawasaki were investigated for 3 yr beginning in 1971. The sulfur content of leaves from both plant species decreased each year, being accompanied by a reduction in airborne sulfur oxides. Cryptomeria japonica, Cinnamomum camphora, Magnolia grandiflora, Ligustrum lucidum, and Camellia japonica planted in five points in the city were examined in terms of their growth and injury. At the nearest point to the pollution source, the order of leaf damage was C.j., C.c., L.l., C.j., and M.g. Ligustrum lucidum and Magnolia grandiflora showed especially good growth even at points near the pollution source.

52703 **APTIC NO. 76741**

Kanagawa Prefectural Bureau of Countermeasures to Environmental Pollution (Japan)

REPORT OF INVESTIGATION ON MECHANISM OF FORMATION OF PHOTOCHEMICAL DAMAGE USING MORNING GLORY AS BIOLOGICAL INDEX, 1974. *(Asagao o shihyo to suru kokagaku kogai no hassei kiko chosa hokokusho 1974). Text in Japanese. 61p., 1974.*

The Scarlet O Hara variety of morning glory was planted at 42 public high schools throughout Kanagawa Prefecture, and plant damage due to photochemical smog and oxidants was investigated. Oxidant concentrations were obtained from 30 monitoring points in the prefecture. Plant damage was investigated for 2 mo beginning from June 1, 1974. The damage was assessed in terms of the percentage of damaged leaves. Damage to leaves of morning glory showed a relationship to the concentration and formation of photochemical smog on eight occasions (June 7, 9, 15, 16, 22, 25, and 26, and July 3 and 8) when the oxidant concentration peaked. Damage over a broad area occurred at concentrations over 50 ppm/hr for 10 hr from 9 a.m. to 6 p.m. Local damage averaged 11-8%, and the maximum was 48%. The total average damage was 40%.

1973

52704 **APTIC NO. 74624**

Berry, Charles R.

THE DIFFERENTIAL SENSITIVITY OF EASTERN WHITE PINE TO THREE TYPES OF AIR POLLUTION. *Can. J. For. Res., vol. 3:543-547, 1973. 15 refs.*

The possibility of selecting clones of eastern white pine with specific sensitivities to different air pollution regimes was investigated. Field screening was carried out by exposing potted seedlings to field conditions for 1 yr or longer in each of three areas where a particular phytotoxicant was known to predominate. The areas were characterized by the following pollution sources and major phytotoxicants: power plant, sulfur dioxide; fertilizer plant, fluorides; and vehicular traffic, oxidants. Selections were made of trees injured during only one season in one area; trees injured during both the summer and winter, but only in one area; trees resistant to air pollution in all three areas; and trees sensitive to air pollution in all three areas. These selections are being propagated for use as specifically sensitive bioindicators of air pollution and as resistant lines for use in seed orchards of white pine. (Author abstract)

52705 **APTIC NO. 74367**

Fujiwara, Takashi, Takashi Umezawa, and Horuhiko Ishikawa

EFFECTS OF MIXED AIR POLLUTANT ON VEGETATION. PART I. SULFUR DIOXIDE, NITROGEN DIOXIDE AND OZONE INTERACTION TO INJURE PEA AND SPINACH. *(Taiki osen fukugo no shokubutsu ni oyobosu eikyo ni kansuru kenkyu, 1: SO2, NO2, O3 fukugo no eikyo). Text in Japanese. Denryoku Chuo Kenkyusho Noden Kenkyusho Hokoku (Noden Inst. Cent. Inst. Electr. Power Rept.), no. 72007:1-11, Aug. 1973. 16 refs.*

The phytotoxic effects of sulfur dioxide, nitrogen dioxide, and ozone, singly and in combination, on the leaves of potted garden pea and spinach plants were investigated in a controlled exposure room under artificial illumination. The aerial concentration of each pollutant was about 0.05, 0.1 and 0.2 ppm. The exposure time was 5 hr for cases of constant concentration exposure and 12 hr for cases where the concentration was changed. Garden peas (under mixed gas conditions) were most severely affected by ozone, followed by sulfur dioxide, and then by nitrogen dioxide. The synergistic action of sulfur dioxide and ozone was substantial, while that of sulfur dioxide and nitrogen dioxide at 0.2 and 0.1 ppm, respectively, was small and negligible with SO2 and NO2 concentrations of 0.1 ppm. The synergistic action of nitrogen dioxide and ozone was too low to cause damage to garden pea. Garden pea injury observed after exposure to a mixture of the three gases was the same as that resulting from exposure to the mixture of sulfur dioxide and ozone. Injury to spinach exposed to sulfur dioxide and ozone was observed when the concentration of ozone was 0.2 ppm; however, injury was not observed when the ozone concentration was 0.1 ppm with SO2 concentrations of 0.1 and 0.2 ppm.

52706 **APTIC NO. 74626**

Ionescu, A. and T. Moacalu

PLANT YIELDING POTENTIAL IN AREAS WITH POLLUTED ATMOSPHERE. *(Potentialul de productie al plantelor in zonele cu atmosfera impurificata. Text in Romanian. Probl. Agric., 25(5):27-35, May 1973. 16 refs.*

The effect of air pollution on agricultural yields and methods to prevent crop damage are discussed based on studies conducted in several zones with heavy air pollution. Fluorine pollution leads to necrosis of wheat, rye, and oat leaves. Corn shows fairly good resistivity. Up to 25% of the plants are affected by air pollution in 41.4% of the cases when they are 500 m from the pollutant source (4.5 ppm fluorine). At 100 m from the source, 80% of the grains are affected; while 42.8% of the plants are affected when located at 500 m from pollutant source. Plants of the Crucifere and Umbelifere species can be cultivated without significant damage. Based on biometric investigation conducted in the Navodari zone, the wheat height in the non-polluted areas was greater than that of wheat in a polluted zone; the yield in unpolluted areas was also greater for both wheat and oats. Sulfur dioxide and oxidants destroy chlorophyll. Losses can reach 34% in the case of Populus or up to 32% with Onopodon achanthium. The absorption spectrum of chlorophyll is altered by the active substances in pollutant dusts. Plant yields are affected when located at 2000 to 3000 m from the polluting source. Sulfur dioxide from sources located 1 to 3 km away caused a 60% loss in vineyards. Under the same circumstances, corn suffered only a 20% loss in a region where the sulfur dioxide level reached 15 ppm. Organic fertilizers are the most efficient means of blocking the toxic activity of the air pollutants. In air polluted zones, plants such as corn, potato, or castor bean should be cultivated to resist pollutants. Laboratory experiments indicated that Harrach and Triumph more resistant than 301, Bezostala, or Ponca.

52707 **APTIC NO. 74460**

Saio, Kenji and Masao Maeda

ON THE ACCUMULATION OF SULFUR INTO SOIL AND THE ABSORPTION OF SULFUR DIOXIDE INTO CROPS. *(Aryusan gasu no dojo e no chikuseki oyobi sakumotsu e no kyushu ni tsuite). Text in Japanese. Osaka-fu Noringijutsu Center Kenkyu Hokoku (Bull Osaka Prefect. Agric. Res. Cent.), no. 10:25-29, 1973. 4 refs.*

The accumulation of sulfur in soil and the absorption of sulfur in-several vegetables (garland chrysanthemum, kidney bean, chinese mustard, and rice plant) exposed to sulfur dioxide gas in an experimental chamber were investigated. The vegetables exposed to sulfur dioxide showed increases in both total sulfur and water-soluble sulfur in the leaves and stems; the rates of increase for water-soluble sulfur were generally higher than for total sulfur. Vegetables grown in soil which was covered with vinyl cloth showed decreases in both total sulfur and water-soluble sulfur in leaves and stems. The ratio of water-soluble sulfur to total sulfur became higher, for plants grown in the covered soil. Atmospheric sulfur dioxide increased the soluble sulfur in oxidized soil, but did not increase the soluble sulfur in reduced soils such as paddy fields.

1972

52708 **APTIC NO. 74593**

Negrutskaya, G. M. and Z. I. Sinelshchikova

OXIDIZABILITY OF CELL CONTENTS AND CYTOPLASM PERMEABILITY AS A CHARACTER OF GAS STABILITY OF PLANTS. *(Okislyayemost soderzhimogo kletok i pronitsayemost tsitoplazmy kak priznak gazoustoychivosti rasteniy). Text in Russian. Fiz. Biokhim. Kul t Rast., 4(6):625-629, 1972. 15 refs.*

The oxidizability of the cell contents and the cytoplasm permeability of pine tree needles permanently exposed to sulfur dioxide and nitrogen oxides in an industrial area were studied in relation to the behavior of these characteristics in control plants. The oxidizability of the cell contents increased with the age of 1 to 3 year-old seedlings, and it was consistently lower in exposed trees, even in those without visible damage. The reduced oxidizability was primarily due to a lesion of the cell membrane and plasmalemma and also to an altered relationship between cuticular and stomatal transpiration. It was also due to a water deficit under the effect of the pollutants. Exposure to the harmful gases also caused a considerable increase in the needle cell cytoplasm permeability.

1971

52709 **APTIC NO. 74617**

Bossavy, J.

BEHAVIOR OF THE NATURAL AND CULTIVATED FLORA IN THE PRESENCE OF AIR POLLUTANT REPORT. *(Etude du comportement de la flore sauvage ou cultivee a l egard des polluants). Text in French. Centre National d Etudes Techniques et de Recherches Technologiques pour l Agriculture, les Forets, et l Equipment Rural (France), Groupement de Grenoble, Contract 69.01.884, 22p., 1971.*

A complex study of the effects of air pollution by fluorine compounds on the vegetation in the Vallee de l Arc, Vallee de la Romanche, and Valleee de la Durance regions in France is presented. Iris, Veratrum, album, Picea excelsa, P. sylvestris, Abies alba, Polygonatum vulgare, Silene inflata, Gentiana lutea, Hypericum species, and Vaccinium myrtillus were the most sensitive species. Coniferous needles which tend to accumulate fluorine were most susceptible to fluorine which caused necrosis, premature loss of needles, and reduced growth. Vast expanses of dead coniferous forests were detected. The fluorine concentrations in the air, determined by means of exposed, calcium hydroxide-impregnated filter paper, ranged from 2.77 to 2.82 g/sq cm/day.

EFFECTS-MATERIALS

1975

52710 **APTIC NO. 74536**

Huber, Hansjoerg and Fritz Joerg

INFLUENCE OF OXIDES OF NITROGEN ON PLASTICS. *(Einfluss von Stickstoffoxiden auf Kunststoffe). Text in German. Staub, Reinhaltung Luft, 35(5):184-187, 1975. 6 refs.*

Literature regarding the influence of nitrogen oxides on plastics is reviewed, and the results of the authors experiments in which fibers and foils of polyamide and polyester were exposed to nitrogen oxides are presented. In a dessicator whose ambient temperature was 20 C and the relative humidity 65%, the samples were exposed to 100 ppm nitrogen oxide plus nitrogen dioxide. The first samples were removed after 404 hrs (17 days), the remaining samples after 1144 hrs (48 days). They were then subjected to tensile measurements and to investigations with the scanning electron microscope. The properties of polyamide changed greatly, while polyester changed only slightly.

1974

52711 **APTIC NO. 76725**

Knotkova, D., K. Barton, and B. Dolezel

EFFECT OF AIR POLLUTION ON MATERIALS AND TECHNICAL EQUIPMENT. *(Vliv znecisteni ovzdusi na materialy a technicka zarizeni). Text in Czech. Ochrana Ovzdusi, 6(6):75-83, June 1974. 22 refs.*

Adverse effects of air pollution on materials are reviewed. Metals are corroded by sulfur dioxide and solid particles containing salts. Such metals can be divided into four classes: immune, significantly passive, those corroded by oxides and hydroxide, and iron in which SO2 stimulates rust. Sulfur dioxide is also a significant corrosive agent for polymers, either through direct reaction or as a stimulant of photochemical degradation, especially in presence of ultraviolet light. Other pollutants which adversely affect polymers are nitrogen oxides, organic substances which produce photolysis products (ozone and peroxides) that degrade polymers, and solid pollutants such as dust and ash which affect physical properties. Silicate construction materials are subject to extractive corrosion, chemical corrosion by salts, and sulfuric acid corrosion which decomposes the material. Ceramics lose their insulating properties due to surface deposits. The effect of pollution on the quality of metallic protective coatings depends on the chemical composition of the coating and on electrochemical reactions between the coating and the metal being protected. Paint pigments react with SO2 which lowers their effectiveness by two to three times in contaminated areas.

52712 **APTIC NO. 74574**

Reiter, A.

PROBLEMS OF INSULATOR SOILING AT THE VIENNA ELECTRIC COMPANY. *(Probleme der Isolatorverschmutzung bei den Wiener Stadtwerken- Elektrizitaetswerken). Text in German. Oesterr. Z. Elektr., 27(12):469-474, Dec. 1974. 17 refs.*

Measures taken to prevent insulator flashover due to pollution at the Liesing transformer substation of the Vienna Muncipal Electric Company are described. Experiments conducted following flashovers during foggy weather with exceptionally high air pollution levels at the substation which is located near a metallurgical plant revealed the protective effect of the hydrocarbon preparation Insojell Insulator WT 165 which consists of mineral oil, synthetic resin, and wax. The coating is applied manually at a thickness of 3 to 5 mm. The service life of this coating in highly polluted areas appears to be about 2 yr.

52713 **APTIC NO. 74959**

Sera, K., J. Hamamoto, and H. Kakimoto

CORROSIVE EFFECTS OF GASEOUS CONTAMINANTS ON ELECTRICAL EQUIPMENT. *(Taikiosen gasu ga denki shozairyo ni oyobosu eikyo ni tsuite). Text in Japanese. Chugoku Denryoku Gijutsu Kenkyusho Gijutsu Jiho (Tech. Rep. Res. Labs. Chugoku Electr. Power Co.), no 46:165-175, Dec. 1974.*

The corrosion of outdoor apparatus by sulfur dioxide from industrial development and population growth is described. The corrosion of the field apparatus of the South Iwakuni transformer and the Shimoachi transformer are discussed. The results of SO2 analysis are given, as well as those of corrosion tests of outdoor apparatus of the inner surface of the pipes and the compressed tanks, and an analyses of the waste gases around the terminals. The SO2 concentration when the M.V. was 0.3-0.4 SO3 mg/100 sq cm/day.

1973

52714 **APTIC NO. 76720**

Barton, K., D. Knotkova, and J. Spanily

CALCULATION OF ATMOSPHERIC CORROSION RATE FROM METEOROLOGICAL AND AEROCHEMICAL DATA. *(Vypocet rychlosti atmosfericke koroze z meteorologickych a aerochemickych dat). Text in Czech. Koroze Ochr. Mater., 17(5):85-89, May 1973. 9 refs.*

A theoretical model of the discontinuous corrosion process of metals is further developed and verified experimentally. The steady-state corrosion rate is expressed as the product of a rate coefficient and the atmospheric humidity and sulfur dioxide content, raised to powers which reflect the reactive mechanisms through which both of these atmospheric factors participate in the corrosion process. Average corrosion rates of steel, zinc, copper, and aluminum were measured for a period of 24 mo at five locations in Czechoslovakia, the USSR, and Hungary. Tests were conducted on samples exposed to precipitation and shielded by a roof. Air humidity and SO2 pollution data were obtained for all test sites. They were suitably averaged and used to compute the corrosion rate from the derived equation. After a good correlation was obtained between calculated and measured corrosion rates, the experimental data were used to compute all constants of the corrosion rate equation for the four metals involved in these tests.

EFFECTS-ECONOMIC

1975

52715 **APTIC NO. 74436**

Nishino, K.

A PERSPECTIVE OF THE INVESTMENT FOR PREVENTION OF AIR POLLUTION: ESPECIALLY FROM THE STANDPOINT OF DESULFURIZATION PROBLEMS. *(Taiki osen boshi no tame no setsubi toshi no mitoshi). Text in Japanese. Waseda Daigaku Shisutemu Kagaku Kenkyusho Kiyo (Mem. Syst. Sci. Lab., Waseda Univ.), no. 6:55-69, March 1975.*

The status of sulfur oxides pollution and its effect on health, sulfur dioxide emission by heavy oil combustion, prospects for importing low sulfur content crude oil and desulfurization of heavy oil, and the necessity for low S content fuel to attain environmental standards are discussed with statistical data. Data on the investment ofr industrial pollution control measures during the period 1966 to 1973 and production plans for industrial pollution control devices from 1973 to 1975 are compiled and analyzed. The statistical data on grievances during the period 1966 to 1971, which showed a constantly increasing trend, are analyzed and evaluated as a barometer of environmental pollution control measures. A first-order model for estimating investment required for pollution control (It) was developed as a function of gross national product (Gt), the number of pollution related grievances (Nt), and the amount of fuel consumption (Dt) (heavy oil), and equations for It, delta Nt, and Dt were derived. Various constants were calculated using data for It, Nt, and Dt, and multiple correlation coefficients were obtained. The coefficient of cumulative investment was negative and fuel consumption was positive, as was expected. The calculation result indicates that grievances will soon reach a ceiling followed by a rapid decrease providing investment is continued as expected.

52716 **APTIC NO. 74705**

Suzuki, Minoru

TRANSITION OF THE SUPPLY-DEMAND RELATION ON THE POLLUTION PREVENTION EQUIPMENT AND ITS TREND IN THE FUTURE. *(Jukyu suii to kongo no doko). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(5):45, May 1975.*

The trend of pollution control equipment sales since 1966 is presented. The gross productions of pollution control equipment including air pollution and water pollution was 113.5 million dollars in 1966, which increased 14.3 times by 1973. The growth of air pollution control equipment sales was largest among all pollution control equipment, and by 1973 it was 22.9 times more than sales in 1966. A rapid growth in pollution control equipment sales appeared since 1969 with the imposed environmental pollution laws. The item showing the largest growth in air pollution equipment sales was flue gas desulfurization equipment (its sale growth from 1963 to 1973 was 30.2 fold), followed by waste gas treatment equipment, dust collectors, and heavy oil desulfurization equipment. The sales of air pollution control equipment are expected to increase even further since companies emitting sulfur oxides flue gas into the atmosphere must now pay an emission fee to the government depending upon the amount of SOx emission (unless they decrease the SOx emission rate).

1973

52717 **APTIC NO. 76672**

Stichting CONCAWE, The Hague (Netherlands)

BENZENE IN MOTOR GASOLINE. AN AD-HOC REVIEW OF PROBLEMS RELATED TO BENZENE REDUCTION OF MOTOR GASOLINES IN EUROPE. *Rept. 1/73, 18p., Feb. 1973.*

The benefits and difficulties associated with reducing the benzene content of gasoline are analyzed. A 1% benzene restriction and a lead limit of 0.4 g/l is estimated to increase the manufacturing cost of gasoline by $4-$8/ton. There is no known human health hazard associated with the present benzene content of gasoline when the latter is used for its intended purpose; hence, the high investment and operating costs of benzene restriction do not appear warranted.

STANDARDS AND CRITERIA

1975

52718 **APTIC NO. 76661**

Detrie, J.-P.

PREVENTION OF INDUSTRIAL COMBUSTION EQUIPMENT-GENERATED AIR POLLUTION. *(La prevention de la pollution atmospherique due aux chaufferies industrielles). Text in French. La Tech. Moderne, 67(1):48-49, 51-52, Jan. 1975.*

New regulations imposed on combustion equipment in France as well as problems of emission abatement and measurement are described. A new 1974 decree envisages the creation of special protection zones as a function of sulfur dioxide, dust, and other pollutant concentrations and requires the use of certain fuels and emission measuring instruments. Unlike some other countries, the achievement of specific emission standards without the use of specific emission control devices is required. Opacity meters are suitable for detecting fine unburned carbon particles, but they do not respond to larger particulates. Continuous recording to SO2 concentrations is required in certain polluted industrial areas.

52719 **APTIC NO. 74388**

Kato, K.

ON THE EMISSION STANDARDS AMENDMENT OF SULFUR OXIDES. *(Iou sankabutsu no haishutsu kijun no kaitei ni tsuite). Text in Japanese. Denki Kyokai Zasshi (J. Japan Elec. Assoc.), no. 619:15-18, May 1975.*

The 1975 amended emission standard forr sulfur oxides is designed to achieve 1/3 of the requirements of the environmental standard originally set for 1977. Based on a survey of the status of sulfur oxides emission and estimated fuel consumption, the K value is reviewed. Stricter control by K value was enforced in 67 out of 99 designated areas. The 1975 emission standard is classified in seven ranks (K value 3.0-17.5), which is one more rank than that of 1974 emission standard (K value 3.5-17.5). The list of old and new K value of 99 designated areas, rank classification of designated areas, and special emission standards issued in 1974 are given. Thee relationship between the K value and maximum ground level concentration is described.

52720 **APTIC NO. 74576**

Matsunami, M.

PRESENT AIR POLLUTION SITUATION AND CONTENT OF EMISSION GAS CONTROL FOR 1976. *(Saikin ni okeru taiki osen no genjo to 1976-nendo haishutsu gasu kisei no naiyo). Text in Japanese. Gijutsu Joho (Serv. News), 6(4):2-9, April 1975.*

Urban air pollution in Japan is discussed in relation to emissions from transportation sources. The number of automobiles in three large cities is 2.65 million, 1/10 of the Japanese total. The energy consumed by transportation constitutes 17.9% of a total of 413,000,000 million kilocalories. Fuel consumption is 17.9% of the total 24 million kl gasoline and 13 million kl light oil). The 1976 nitrogen dioxide standard is 0.25 g/km. Nitrogen oxides in Tokyo are increasing rapidly. In 1974 the number of oxidant alarms decreased a little compared to the preceding year. Carbon monoxide in Tokyo is decreasing. The NOx standard is applicable to automobiles with a capacity of less than 10 passengers and whch use gasoline or liquefied gas as fuel. The emission weight system adopted is the same as in 1975. Engine exhaust tests are the 10-mode (hot cycle) and 11-mode (cold cycle) type, the same as in 1975. The emission regulation is applicable to new cars produced after March 1, 1977 (for imported cars, after March 1, 1978) and to those cars which are so designated after April 1, 1976. It is anticipated that, compared with 1975, the average NOx emission will be reduced by 50% for those vehicles of less than 1000 kg and by 29% for others. Carbon monoxide emissions from trucks using gasoline or liquefied gas as a fuel is to be reduced as much as technically possible. Tax measures to favor low-pollution cars are being considered.

52721 **APTIC NO. 74718**

Nishimura, Hajime

WAS THE RETREAT FROM 1976 AUTOMOTIVE EXHAUST GAS EMISSION STANDARDS MADE UNDER CORRECT TECHNOLOGICAL CONSIDERATIONS? *(Jidosha haigasu no 51-nen kisei no kotai wa tadashii gijutsuteki kento no ue ni nasaretaka). Text in Japanese. Gendai Kagaku (Mod. Chem.), 48(3):19-21, March 1975.*

A two-year postponement of enforcement of the proposed 1976 Japan automotive exhaust gas emission standards for NOx is discussed. The proposed 1976 emission standards were: CO, 2.10 g/km; HC, 0.25 g/km; and NOx, 0.25 g/km. However, for 1976, the interim standard for NOx emission was set at 0.6 g/km, with a maximum allowable value of 0.85 g/km. Testimony before the United States Senate in May 1974, and data submitted to the American Academy of Sciences (Rept., November 1972) indicated that the Honda CVCC engine demonstrated its capacity to more than meet CO, HC, and NOx emission standards. Data presented in May 1974 included average emission values for CO (1.4 g/km); HC (0.125

g/km); and NOx (0.5 g/km). In the data from the Academy of Sciences report, the values were: CO, 1.6; HC, 0.16; NOx, 0.27 g/km. Honda Gijutsu, manufacturers of the CVCC engine claimed that conversion of CVCC engines to maintain NOx emissions below 0.6 g/km presented driving problems. In testimony before the United States Senate, it was asserted that only an expert driver would notice the slight loss of throttle response in the midspeed range.

52722 **APTIC NO. 74826**

Shidara, M.

ON THE EMISSION CONTROL OF SULFUR OXIDES. *(Iou sankabutsu no haishutsu kisei no keii to kozai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(7):751-764, July 1975. 6 refs.*

Emission controls for sulfur oxides are usually carried out by three different methods: control of SOx in flue gas, control of SOx from a unit facility, and control of total SOx emissions from a plant. The second method was used in Japan by establishing emission standards which were calculated from effective stack heights and a set of K values for various facilities. Total emission control is necessary for reducing the absolute quantity of pollutants. Eleven areas, including the most large cities and major industrial areas, were designated for total SOx emission control based on total fuel consumption or maximum compounded ground concentration. Total allowable emission for each plant was determined by fuel consumption and constants specified for each area. The plants subjected to the total emission control were those consuming a minimum amount of fuel from 0.1 kl/hr to 1.0 kl/hr which were determined by the prefectural governor to account for more than 80% of the emissions in the area.

52723 **APTIC NO. 74785**

Sogabe, K.

ON THE ENVIRONMENTAL QUALITY STANDARD REGARDING AIR POLLUTION. *(Taiki osen ni kakaru kankyo kijun ni tsuite). Text in Japanese. Preprint, p. 91-93, 1975. (Presented at the Environmental Pollution Control Technical Symposium, Tokyo, March 17, 1975.)*

Environmental standards issued on August 8, 1973 for sulfur dioxide, carbon monoxide, airborne particulates, nitrogen dioxide, and oxidants were as follows: SO2, daily average 1-hour value below 0.04 ppm and 1-hour value below 0.1 ppm; CO, daily average of 1-hour value below 10 ppm and 8-hour average of 1-hour value below 20 ppm; airborne particulates, daily average of 1-hour value 0.10 mg/cu m and 1-hour value below 0.20 mg/cu m; NO2, daily average of 1-hour value below 0.02 ppm; and oxidants, 1-hour value below 0.06 ppm. The nitrogen oxides emission standards were as follows: new gas boiler, 130 ppm; used gas boiler, 170 ppm; new coal boiler 480 ppm; used coal boiler, 600 ppm (low quality-coal boiler, 750 ppm); new liquid fuel boiler, 180 ppm; used liquid fuel boiler, 230 ppm; metal heating furnace, 200 ppm; used heating furnace 220 ppm; and new and used nitric acid manufacturing facilities, 200 ppm. The environmental standards for CO, airborne particulates, and oxidants were to be accomplished as soon as possible, while those for SO2 and NO2 were to be accomplished in 5 years.

52724 **APTIC NO. 74527**

Suzuki, T.

A CONSIDERATION OF ENVIRONMENTAL STANDARDS PERTAINING TO AIR POLLUTION. *(Taiki osen no kankyo kijun ni tsuite no hitotsu no kosatsu). Text in Japanese. Seikatsu Eisei (J. Urban Living Health Assoc.), 19(1):1-10, 1975. 13 refs.*

Environmental standards were first established in the USSR in 1951 as maximum allowable concentrations of 10 pollutants, which has since been extended to 100 pollutants. In the U. S., environmental standards for five pollutants were established in 1970, and have since been extended to 25 pollutants. The definitions of environmental standards as legal standards, guidelines, environmental goals, and criteria for determining environmental pollution are discussed. The concept of environmental standards and criteria for determining environmental standards in the USSR, U. S., and West Germany are reviewed. The Atmospheric Pollution publication published in 1963 and Air Quality Criteria and Guides for Urban Air Pollution published in 1972 by WHO (World Health Organization) are reviewed. The international effort to unify environmental standards discussed at the 1972 Stockholm Conference and 1972 and 1973 WHO meetings are also reviewed with interpretation of various terms used. The information required for determining air quality and criteria for environmental standards are also discussed.

52725 **APTIC NO. 74394**

Shizuoka Prefectural Government (Japan)

POLICIES TAKEN FOR AIR POLLUTION CONTROL. *(Taiki osen boshi ni kanshite kojita shisaku). Text in Japanese. In: Shizuoka Prefectural Environmental White Paper, 1974, p. 72-103, 1975.*

New air pollutant emission standards for Japan that are effective as of April 1, 1974 are reviewed. The new sulfur oxide emission K-value for Fuji, Fujimiya, Shiibagawa-cho, Fukikawa-cho, and Kamahara-cho is 4.67 as compared to 7.59 for the previous standard. The new K-value for Yubi-cho and Shimizu is 6.42; and that for Shizuoka, Hamamatsu, and Kami is 14.6, reduced from previous values of 9.34 and 22.2, respectively. Existing facilities that violate the new standards are subjected to penalties as of July 1, 1974. The new soot emission standards are: 0.10 to 0.30 g/normal cu m for oil and gas boilers, depending on capacity; 0.80 g/normal cu m for boilers under 5000 kcal/kg of coal; 0.20 to 0.40 mg/normal cu m for heating or melting furnaces; 0.20 to 0.80 g/normal cu m for drying furnaces; and 0.20 to 0.70 g/normal cu m for incinerators. New nitrogen oxide emission standards range from 130 ppm for new gas boilers and 170 ppm for used gas boilers to 480 ppm for new coal boilers and 750 ppm for used coal boilers. Countermeasures for SOx control include the use of low sulfur oil and the installation of desulfurization devices.

52726 **APTIC NO. 74573**

Environmental Agency (Japan), Air Quality Bureau

ON THE EMISSION STANDARD AMENDMENT OF SULFUR OXIDES. *(Iou sankabutsu no haishutsu kijun no kaitei ni tsuite). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 10(3):95, May 1975.*

The emission standard for atmospheric sulfur oxides is to be amended by the Environmental Agency and the new standard becomes effective on April 15th, 1975. The new standard adds one more rank in the K value classification which will have a total of 8 rankings. Most of the cities are now reclassified into the new rankings which require tighter emission control. The most polluted cities, such as Tokyo, Yokohama, Kawasaki, Nagoya, Yokkaichi, Osaka, and Kobe, will be classified to Rank-1 which requires their SOx emission control to the K value of 3.0 compared to their previous K value of 3.5 according to the old ranking. The average SOx emission control will be tightened by 25%.

52727 **APTIC NO. 74781**

Shizuoka Prefectural Government (Japan)

ENVIRONMENTAL STANDARDS PERTAINING TO AIR POLLUTION. *(Taiki osen ni kakawaru Kankyo kijun). Text in Japanese. In: Pollution White Paper in 1974, p. 68-72, 1975.*

Environmental standards for five pollutants sulfur dioxide, carbon monoxide, airborne particulates, nitrogen dioxide, photochemical oxidants) are described. Shizuoka Prefecture, so far, has collected insufficient pollution data, or has not met these pollutant standards completely. Standards for sulfur oxides (SO2) and NO2 must be attained by 1978. Standards for airborne particulates, CO, and photochemical oxidants are to be attained as soon as possible. Values of the pollutant standards are as follows: sulfur oxides: average daily values, based on hourly values, must be below 0.04 ppm and hourly values must be below 0.01 ppm; average daily values, based on hourly values must be below 10 ppm and average 8-hour values of hourly values must be below 20 ppm; airborne particulates (below 10 micron in diameter): average daily values, based on hourly values, must be below 0.10 mg/cu m and hourly values must be below 0.20 mg/cu m; NO2: average daily values, based on hourly values, must be below 0.02 ppm; and photochemical oxidants: hourly values must be below 0.06 ppm. There were many victims of photochemical oxidants in June 1973 in Shizuoka Prefecture. Eight photochemical oxidant warnings have been issued since.

1974

52728 **APTIC NO. 74320**

Kure, Fujihiko

ON THE REGULATION OF OVERALL EMISSION. *(Soryo kisei ni tsuite). Text in Japanese. Preprint, Science Council of Japan, Organizing Committee of International Environmental Protection and Scientific Conference, 3p., 1974. (Presented at the Domestic Symposium for International Environmental Preservation and Scientific Conference, 3rd, Kyoto, Japan, Nov. 1974.)*

Total emission controls for various cities and prefectures in Japan are listed. Air pollutants subject to the control include: sulfur oxides in the Tokyo metropolitan area, Kanagawa Prefecture, Niigata Prefecture, Fukui Prefecture, Mie Prefecture, Kyoto-fu, Osaka-fu, Okayama Prefecture, Yamaguchi Prefecture, Ehime Prefecture, and Kawasaki Prefecture; nitrogen oxides at Mie Prefecture and Osaka-fu; and particulates at Kanagawa Prefecture. In Osaka-fu, the allowable total emissions of SOx and NOx are calculated by computer simulation as 53,990 tons/yr and 35,870 tons/yr, respectively. The allowable total emission of SOx for Kawasaki City is set at 27,341 tons/yr by the same calculation method. Sutton s diffusion equation is used for the computer simulation at Osaka-fu, whereas Ito s equation is used at Mie Prefecture and Pasquill s equation at Okayama Prefecture.

52729 **APTIC NO. 74525**

Watanabe, Hiroshi

THE BASIC IDEA FOR THE ENVIRONMENTAL STANDARD FOR SULFUR OXIDE GASES. *(Io sankabutsu kankyo kijun no kangae kata). Text in Japanese. Ao To Midori Blue Green), 3(7):66-70, July 1974.*

The environmental standard for sulfur oxides was revised in May 1973. The new law sets the highest hourly value at 0.1 ppm and the average 24-hour value at 0.05 ppm. Environmental standards are set to minimize air pollution effects on human beings. The World Health Organization classified 4 degrees of air pollution. The first degree is that concentration that has no effect and is not detectable; the second degree is that concentration that irritates sense organs and causes damages to plants; the third degree is that concentration that causes injuries to important organs, chronic disease, and shortening of life; and the fourth degree that concentration that causes acute disease and death. In Russia, 4 conditions are given to evaluate environmental standards, namely, no retardation to the growth of children; no retardation to the recovery of disease of patient; no obstruction of peaceful life of retired people; and no retardation of recovery of body conditions of workers. Principally, environmental standards are to be selected and determined by citizens. Scientists must conduct extensive studies on various concentrations to help make the selection.

52730 **APTIC NO. 74415**

VDI-Commission on the Conservation of Clean Air

EMISSION LIMITS FOR NITRIC ACID PLANTS. *(Auswurfbegrenzungen Salpetersaeureanlagen). Text in German. VDI (Ver Deut. Ingr.) Handb. Reinhalt. Luft, no. 4:1-7, March 1974. 10 refs.*

Emission limits for nitric oxide plants and methods for emission abatement at such plants are described. High-pressure plants emit less nitrogen oxides than low-pressure units. Emission abatement is possible by alkaline absorption in an end stage, using sodium hydroxide solution. This method, which is does not retain excess amounts of nitric oxide and nitrogen dioxide, is applicable only when the resulting nitrite solution can be utilized. Emission abatement by catalytic reduction with hydrogen is also possible and is applicable to gases containing containing carbon monoxide and dioxide. Sulfur compounds interfere with the catalytic reduction process. The maximum allowable NOx emission concentration for new plants operating at pressures under 3.5 bar or over 8 bar is limited to 1 and 0.7 g NO/cu m during 95% of the total operating time at normal cooling water temperatures. At elevated cooling water temperatures, the emission concentration is limited to 1.5 and 0.9 g/cu m, respectively.

52731 **APTIC NO. 74557**

NOX DAMAGES: CONDITIONS AND REGULATIONS. *(NOx no higai jokyo to kisei). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(9):36-41, Sept. 1974.*

Unlike sulfur oxides, nitrogen oxides concentrations in major Japanese cities increased from 1968 through 1972. The total NOx emission increased from 200,200 tons in 1965 to 443,800 tons in 1970. Air Pollution Prevention Law article 23 section 1 states that an emergency is to be declared when hourly concentration of oxidants, as a secondary air pollutant, exceeds 0.15 ppm. The number of emergencies issued in 21 major cities and prefectures increased from 98 in 1971 to 176 in 1972 and 328 in 1973. The total injuries reported from 1970 was 119,216. Of these, 53% were junior high school students, while about 25% were elementary school students. Damage to plants was greatest when oxidant concentration exceeded 0.15 ppm for more than 8 hr. A new environmental standard for NOx for Tokyo and Chiba was issued on May 8, 1973. It was aimed at reducing hourly NOx concentration for 24 hr to 0.02 ppm in 5 yr. New emission standards for major NOx-emitting equipment are as follows: boilers using liquid fuel, new boiler 180 ppm, used boiler 230 ppm; boilers using gas fuel, new boiler 130 ppm, used boiler 170 ppm; boilers using solid fuel, new boiler 480 ppm, used boiler 600 ppm; metal furnace, new furnace 200 ppm, used furnace 220 ppm; oil heating furnace, new furnace 170 ppm, used furnace 210 ppm; and nitric acid manufacturing facilities, new and old facilities, 200 ppm.

52732 **APTIC NO. 74800**

ORDER FROM PRIME MINISTER S OFFICE ON THE PARTIAL AMENDMENT OF ENFORCEMENT PROVISIONS TO AIR POLLUTION CONTROL REGULATIONS. ORDER NO. 71. *(Taiki osen boshiho shiko kisoku no ichibu o kaisei suru sorifurei. Sorifurei Dai 71-go). Text in Japanese. Kanho (Off. Gaz.), no. 14376:3-4, Nov. 30, 1974.*

The text of Order No. 71 from the Japan Prime Minister s Office, amending the Air Pollution Control Law, Enforcement Regulations (1971), is reproduced. Five equations are given for calculation of total amount emission standards for sulfur oxides. The maximum permissible composite ground concentrations of sulfur oxides must be calculated as a total of all emitted sulfur oxides from a specified factory and be a constant for all specified factories in a designated region. When three or more specified factories are located so close to each other that they can be considered as a specified factory unit, another value can be calculated for the total amount emission standard. When increased usage of raw material or fuel results in increased emission of sulfur oxides, the permissible amounts of sulfur oxides emitted per unit increase must be decreased. Prefectural governors can set other total amount emission standards, subject to approval by the head of the Environmental Agency. Total amount emission standards can be calculated from atmospheric diffusion equations and model simulations, but results must be in reasonable agreement with reality. Schedules must be established for gradual reduction of smoke (sulfur oxides) emission. Comprehensive records on smoke emission must be kept for three years. Corrections of minor misprints in the previous regulations are included in the order.

52733 **APTIC NO. 76668**

Stichting CONCAWE, the Hague (Netherlands)

EXISTING ENVIRONMENTAL REGULATIONS OF CONCERN TO THE OIL INDUSTRY IN WESTERN EUROPE. *Rept. 7/74, 30p., Nov. 1974. 54 refs.*

Environmental regulations relating to the oil industry in Western Europe are tabulated. The regulations pertain to standard specifications and legal limits for the sulfur content of fuel oils, gasoline composition and quality, vehicle emissions from light duty gasoline engines, refinery effluents in France, and environmental noise control. A reference list of legislation and regulations, standards, technical requirements, and codes of practice for design, construction, and operation of oil pipelines in Western Europe is also provided. The gasoline engine emission regulations pertain to carbon monoxide and unburned hydrocarbons, and the gasoline composition specifications pertain to the maximum permissible lead content.

52734 **APTIC NO. 76671**

Stichting CONCAWE, The Hague (Netherlands)

EXISTING ENVIRONMENTAL REGULATIONS OF CONCERN TO THE OIL INDUSTRY IN WESTERN EUROPE. *Rept. 2/74, 18p., March 1974. 16 refs.*

Standard specifications and legal limits for the sulfur content of fuel oils and gasoline composition and quality are tabulated for various Western European countries along with regulations for refinery effluents in France. The specifications for fuel oil are given in terms of viscosity classification and permissible sulfur content (wt%). Regular and premium grade gasolines are specified according to permissible contents of lead, aromatics, and benzene. The refinery effluent data for France are given in terms of effluent volume per ton of crude oil processed (excluding rain and ballast water).

1973

52735 **APTIC NO. 76719**

Weigel, Pavel

A CONTRIBUTION TO CLASSIFICATION OF AIR POLLUTION SOURCES. *(Prispevek k hodnoceni zdroju znecistovani ovzdusi). Text in Czech. Ochrana Ovzdusi, 5(3):46-47, March 1973.*

A proposed air pollution law introduces the concept of an index of pollutant danger. Its values are based on the maximum allowable short-term concentration of pollutants. It is proposed that for comparative calculations this coefficient may be more conveniently expressed in terms of mass and called the equivalent emission which may be defined as the weight of a pollutant whose harmful qualities are equivalent to those of a unit weight of sulfur dioxide. Since the equivalent emission characterizes an absolute measure of air pollution, it can be used to compute the pollution output of plants for tax purposes, provide design documentation, and perform emission balancing computations. A table of equivalent emissions for 27 common pollutants is included.

LEGAL AND ADMINISTRATIVE

1975

52736 **APTIC NO. 74834**

Anton, Peter, Paul Bruegel, and Karl Heinz Carlsen

DESULFURIZATION OF FUEL AND FLUE GAS IN CASE OF APPLICATION OF HEAVY FUEL OIL; COST OPTIMIZATION THROUGH SYSTEMS ANALYSIS FOR THE FEDERAL REPUBLIC OF GERMANY. *(Brennstoff- und Rauchgasentschwefelung bei Einsatz von schwerem Heizoel; Kostenoptimierung durch eine Systemanalyse). Text in German. Erdoel Kohle-Erdgas-Petrochem., Suppl. 74/75; 395-402, 1975.*

In order to find the optimum combination of residual oil and flue gas desulfurization processes, the Federal Republic of Germany instituted a systems analysis covering the period from 1975-2005. Strategies for reducing the emissionoof sulfur dioxide have been utilized, according to the degree of intensity in the construction of desulfurization plants which were based on laws for allowable specific sulfur contents of heavy oil. Reducing the expected SO2 emission by 40 to 70% will lead to costs between $700 and $833 per ton of sulfur removed. Referring to the costs to all heavy fuel oil and electricity produced will lead to additional costs of $4.30 to $8.70 per ton of heavy fuel oil and $.001 to $.002 per kWhr.

52737 **APTIC NO. 74440**

Hamanaka, H.

AIR POLLUTION CONTROL LAW. *(Taiki Osen Boshi Ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(5):770-773, 1975.*

The Air Pollution Control Law was partially amended in the spring of 1975 and the total emission control regulation was included. The government ordinance and Prime Minister's Office Ordinance are being prepared. The total emission control regulation of sulfur oxides formulated based on the reduction plan for total flue gas emission in designated areas is discussed with reference to the total emission control of nitrogen oxides also to be enforced at the earliest possible time. The procedure for designating specific areas, formulating reduction plans for total flue gas emission based on the environmental standard, and emission control plans for individual pollutant sources are discussed in reference to the government and other ordinances. The basic concept of total emission control regulation, the theoretical basis, and procedural methods of determining total emission quantity, and problems involved in enforcing such regulations are also discussed.

52738 **APTIC NO. 74865**

Kawazoe, Kunitaro

OUTLINES OF STUDIES ON THE DETECTION AND PREVENTION OF POLLUTION IN URBAN ENVIRONMENT. *(Toshi kankyo no osen keisoku/bojo ni kansuru kenkyu gaiyo). Text in Japanese. Seisan Kenkyu (Prod. Res.), 27(3):101, March 1975.*

Systems analyses for urban pollution studies are outlined. Urban pollution studies are divided into three areas of inquiry: detection and measurement of pollution; control and elimination of pollutants; and environmental conservation. After a 3-year investigation of pollution and pollutants, it is hoped that the systems approach to environmental conservation would become feasible. Studies on detection and measurement methods are applied to components of atmospheric and water pollution. Regional monitoring systems, sampling methods, and field investigations are included in the systematization of pollution measurements. Studies on control and removal or organic and inorganic environmental pollutants include improving the quality of industrial waste water by suitable treatment; systematization of the use of recycled water or water inclosed systems; evaluation of pollution prevention and elimination technology on three levels (production; factory; and simulated environmental model). The development of environmental conservation systems are based on pollutant diffusion and evaluation of natural purification effects. Pollution conditions in water basins are under investigation, including interaction of heavy metals and organic compounds. When a dynamic model of the water basin can be formulated, environmental change and pollution effects can be predicted, and purification and conservation can be effected.

52739 **APTIC NO. 74505**

Kubota, T.

PRESENT POLICIES FOR THE ORGANIC COMPOUNDS COUNTERMEASURES AND TREND OF THE REGULATION. *(Yukikagobutsu taisaku no genjo to kisei no hoko). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(5):80-84, May 1975.*

Many organic compounds are used in agricultural chemicals, drugs, industrial chemicals, food additives, fertilizers, and fuels and the resulting pollution problems are widespread. These compounds include the imported ones such as quinoform, thalidomide, BHC, and AF-2, which have led to the issuance of regulations concerning preliminary testing before marketing new products. The complaints concerning organic compounds primarily concern malodors from medium and small plants in congested areas rather than the toxicity of the compounds, which indicates that the absence of complaints does not necessarily mean the absence of pollution. Studies on organic compounds from the aspect of pollution including the distribution of organic compounds in the natural environment, hydrocarbons emitted from industries, and their relationship to photochemical smog are reviewed. The organic compound countermeasures in printing, painting, chemical, petrochemical, and other industries are discussed with advantages and disadvantages of each method. The HC countermeasures taken in Tokyo are also summarized.

52740 **APTIC NO. 74936**

Laessig, V.

CONSIDERATIONS ON THE SOUNDNESS OF SULPHUR DIOXIDE IMMISSION PARAMETERS DEMONSTRATED BY THE EXAMPLE OF THE TOWN OF GERA. *(Betrachtungen zur Stichhaltigkeit von Schweldioxid-Immissions- Kenngroessen am Beispiel der Stadt Gera). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(2):120-125, 1975. 5 refs.*

The extent to which the municipal area of Gera can be classified into basic sulfur dioxide load levels on the basis of the proposed guidelines for planning, implementation, and evaluation of immission measurements is discussed. The sulfur dioxide measurement network, which has been in operation for several years in the Gera area, is described. The classification follows the provisions of Appendix 2 of the first implementation clause of Regulation No. 5 of the Law on Environmental Protection and Control. The differences observed during the various measurement periods are discussed.

52741 **APTIC NO. 74529**

Masui, T.

INTEGRATED POLLUTION MANAGEMENT SYSTEM. *(Kogai sogo kanri sisutemu). Text in Japanese. Nippon Denki Giho (Tech. Rept. Nippon Electric Co., Ltd.), no. 2:100-103, March 1975.*

Air pollution control depends on purely scientific and technical aspects for the reduction in pollutant emission by physical or chemical means and on administrative aspects for the accurate assessment of pollution conditions and planning of control measures and enforcement. The integrated pollution management system is designed to support pollution control administration and coordinate administrative aspects and technological aspects. The concept of the integrated pollution management system consisting of a monitoring and control system, an administrative system, and a research and planning system with the pollution data base as the center of these three systems is described. The function of the integrated pollution management system includes pollution monitoring (air, water, and noise pollution monitoring), administrative tasks (registration system, handling of complaints, and information service), and research, survey, and planning (statistical study, data analysis, and long-term control planning). The constitution of the integrated pollution management system including the pollution monitoring system (on-line real-time system) and the pollution information management system (multiphase data processing) is described with a block diagram.

52742 **APTIC NO. 74545**

Matsumura, Tetsuo

FREQUENCY OF PHOTOCHEMICAL SMOG IN 1974. *(Showa 49 nendo ni okeru kokagaku sumogu no hassei jokyo). Text in Japanese. Seikatsu to Kanyo (Life Environ.), 20(3):13, 1975.*

A greater frequency photochemical smog was reported in 1974 in Japan than in previous years. During 1974, photochemical smog alerts were announced in 22 prefectures. Yamaguchi and Tokushima Prefectures had no warnings in previous years. The prefectures on the Pacific coast and facing the Seto Inland Sea are in the photochemical smog belt. In 1974 there were fewer alerts (28) in July than in June (81) or August (90). The total number of emergency warning in 1974 was 288, 328 in 1973, and 176 in 1972. The number of reported sufferers from photochemical pollution in 1974 was 14,725, 31,966 in 1973, and 21,245 in 1972.

52743 **APTIC NO. 74439**

Nakano, Michio

AIR POLLUTION CONTROL MEASURES IN OSAKA. *(Osaka no taiki osen taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(5):811-816, 1975.*

The air pollution control plan for Osaka is reviewed. Using the concept of total emission control regulation, the emission source control basic plan for 275 plants which consume 90% of the total energy was formulated. The pollutant emission quantity (tons/yr) of sulfur oxides is to be reduced from 43,957 in 1972 to 9332 in 1978, of nitrogen oxides from 35,266 in 1972 to 16,000 in 1978 and 6542 in 1981, and of particulate matter from 48,038 in 1972 to 18,400 in 1978 and 3516 in 1981. The calculation procedures of the above-mentioned emission reduction using emission factors are described. Desulfurization, fuel conversion, reduction in sulfur content, denitrification, fuel conversion, reduction in nitrogen content, and low NOx burners are discussed with the estimated reduction ratio by each means during the period from 1973 to 1978.

52744 **APTIC NO. 74825**

Ogaki, Hisao

OBJECTION AGAINST THE PLANT ENLARGEMENT OF TOA NENRYO KOGYO K.K. *(Toa Nenryo Shimizu kojo zosetsu keikaku ni hantaishite). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo (Japan), p. 282-283, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975, Paper 138.)*

The activity of inhabitants in Shimizu city against the expansion of a fuel company s plant is described. Because of the corruption of the pollution control committee which has been judging the expansion of city s industries, the citizens group investigated the city s air pollution for nitrogen dioxide, pH of rainfall, corrosion of copper plate, and meteorological conditions. Rainfall with pH 3.7 was observed near the seashore industrial area, which was similar to the results obtained for Yokkaichi city, one of Japan s most polluted cities. The NO2 level at the industrial area was more than 0.04 ppm, and the

NO2 level in the surrounding areas was between 0.020 and 0.029 ppm on sunny days, but it was 0.009 ppm on cloudy days.

52745 **APTIC NO. 74799**

Okamoto, K.

ON INTRODUCTION AND ENFORCEMENT OF TOTAL AMOUNT REGULATIONS FOR SULFUR OXIDES IN THE KASHIMA REGION. *(Kashima chiku ni okeru iou sankabutsu no soryo kisei no donyu to jisshi ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(4):308-312, 1975.*

Present and future plans for control of sulfur oxides by total amount regulations in the Kashima Coastal Industrial Region, Japan, is summarized. Some 64 major industrial enterprises are to be located in this area, with 30 of them already in operation. The industrial region will cover an area of 20.2 million sq m. Production capacities at present are: blister steel, 6.4 million tons/year; electric power, 5.4 million kW; refined petroleum, 180,000 barrels/day; and petrochemical ethylene, 300,000 tons/yr. Projected capacities are: blister steel, 16 million tons; electric power, 6.6 million kW; refined petroleum, 600,000 barrels/day; and ethylene, 1.1 million tons/ year. The total emission of sulfur oxides (1971 data) was 8000 N cu m/hr. By 1976, the projected total emission of sulfur oxides will be 16,000 N cu m/hr, but the actual emission is to be 9500 N cu m/hr (maximum daily average of 0.05 ppm). The maximum allowable ground concentration of sulfur oxides per factory at completion of the complex should be below 0.007 ppm. In October 1973, 38 companies, the Ibaraki Prefectural and municipal authorities, and businesses, concluded a pollution control agreement, with schedules for environmental improvement. The emphasis will be on use of low-sulfur fuel by medium to small-sized enterprises, and installation of desulfurization equipment by large enterprises. Simulations and environmental impact studies are being undertaken.

52746 **APTIC NO. 74528**

Oya, Fumihiko

THE PURPOSE AND TREND OF ENVIRONMENTAL POLLUTION CONTROL SYSTEM. *(Kogai kanshi, kanri system no igi to doko). Text in Japanese. Nippon Denki Giho (Tech. Rept. Nippon Electric Co., Ltd.), no. 2:5-17, March 1975.*

The circumstances leading to the development of the present air pollution monitoring system in Kanagawa, the present status of the monitoring network, and future trends are discussed. The present status of air pollution in Kanagawa is described with reference to the geographical and meteorological conditions, industrial production activity, and photochemical smog. Air pollution control policy, enforcement organization, and control measures are also discussed. The expansion of the monitoring network, pollutant source monitoring system, speed-up of pollution data transmission and processing, emergency procedures, and forecasting procedures are described with a list of monitoring stations. Descriptions of the organizational structure of the air pollution monitoring center, monitoring telemeter systems, and major instruments in the monitoring system are given. Trends and tasks for future monitoring systems are also discussed.

52747 **APTIC NO. 74946**

Sagawa, Haruo

WASTE INCINERATION PLANT AT SUGINAMI WARD AND ENVIRONMENTAL POLLUTION. *(Tokyo Suginami seiso kojo to kogai). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo (Japan), p. 266-267, 1975. (Presented at the Executive Committee Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

The construction plan for an incinerator in Suginami ward was met by strong opposition from residents because of pollution. An agreement including the following items was reached: resident participation in policy-making and operation, use of the newest and highest available pollution control techniques and establishment of emission control standards and absolute emission concentrations which are subject to revision. The emission standards (ppm) (target values) by concentration and absolute concentration (kg/hr) are 30 and 10.28 (10 and 3.43) for sulfur oxides, 150 and 24.74 (50 and 8.25) for nitrogen oxides, 25 and 4.82 (10 and 1.61) for hydrogen chloride, and 0.03 g/N cu m and 3.6 (0.01 g/N cu m and 1.2) for particulate matter. Control standards for waste water disposal, noise, vibration, and odors were also established.

52748 **APTIC NO. 74715**

Shibata, Tokue

PROGRESS OF THE INVESTIGATIVE COMMISSION FOR SEVEN LARGE CITIES. *(7 Daitoshi chosadan katsudo no keika). Text in Japanese. Kogai Kenkyu (Stud. Publ. Nuisance), 4(4):1-17, April 1975.*

The governmental decision to postpone enforcement of the 1976 emission standards for NOx (0.25 g/km) is discussed by a member of the 7 large cities (Tokyo, Kawasaki, Yokohama, Nagoya, Kyoto, Osaka, Kobe) Investigative Commission. The Central Committee for Examination of Pollution Countermeasures is being criticized for being ineffectual, inexpert, and too easily swayed by industrial interests. Portions of testimony by Toyota and Nissan before the Investigative Commission in September 1974 are included, and indicate their lack of firm committment to research on pollution abatement technology, in favor of profitability. Hondo, Toyo Kogyo (Mazda), and Mitsubishi presented data at the same hearing which implied that NOx emission standards were within reach by 1976. Their cars are necessarily more expensive because of research costs and production line changes. Drivability is also decreased by production changes. In November 1974, Toyo Kogyo announced that it was possible to mass-produce automobiles with an NOx emission of 0.4 g/km. Nonetheless, interim government standards for NOx emission were set at 0.6 g/km, in spite of recommendations and expert testimony by the Investigative Commission.

52749 **APTIC NO. 7484**

Shinkai, A.

FINISHING PLANNING OF ANTI-POLLUTION PROGRAM OF MIZUSHIMA AREA. *(Mizushima chiiki kogai boshi keikaku no sakutei o oete). Text in Japanese. Shi Toshi (New Cities), 29(3):38-43, March 1975.*

According to Article 19 of the Pollution Countermeasure Fundamental Law, the anti-pollution program of the Mizushima area was approved by the Prime Minister along with those for 11 other areas in December 1974. The new program is to cover 4 yr, 1974-1977. After April 1, 1977, sulfur dioxide is expected to be less than the environmental standard, 1 yr sooner than what is required by law. Regarding nitrogen dioxide pollution, 8 yr are allowed for Mizushima, though efforts are being made to reach the target by the end of 1978. Recently, sulfur oxides have rarely been more than 0.2 ppm. Nitrogen oxide emissions appear to be on the increase, but no urgent control steps have been necessary. There were 14 alarms for photochemical oxidants issued in 1973 as compared to three in 1972. Big enterprises are going to install stack gas desulfurization facilities to increase their capacity from 130,000 normal cu m/hr to 9,660,000 normal cu m/hr. Simulation calculations of nitrogen oxide emissions to be tolerated in coastal areas arrive at a figure of 2000 normal cu m/hr.

52750 **APTIC NO. 74389**

Sogabe, K.

ON THE AIR POLLUTION CONTROL REGULATION. *(Taiki osen boshi ni kansuru kisei ni tsuite). Text in Japanese. Haikan to Sochi (Piping Process Mach.), 15(5):50-62, May 1975.*

The Basic Law for Environmental Pollution Control is reviewed. The fundamental ideology of pollution control, range of pollution control, environmental standards, and national policy concerning pollution control are discussed. The content of the Air Pollution Control Law is summarized. The purpose of the Air Pollution Control Law, a list of substances regulated by the law, the type of facilities regulated by the law, control standards, type of control means, and emission standards for flue gas (sulfur oxides, particulate matters, and toxic substances) are described. The environmental standard for each pollutant and the target date for achieving the environmental standard are also given. The list of cities where the 7-rank K value control regulation for SOx is enforced is given. The procedure for registration in compliance with the law is also described.

52751 **APTIC NO. 76657**

Takagi, H.

ON ENFORCEMENT OF AGGREGATE POLLUTANTS CONTROL. *(Soryo kisei no jisshi ni tsuite). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(8):14-23, April 1975.*

Since November 30, 1974, the aggregate volume of air pollutants have been controlled in Japan in areas where it is difficult to maintain the environmental air standard. The total pollutant load tolerated from emission sources is arrived at by taking into consideration meteorological topographical conditions of the area and conditions of the emission sources. Sulfur oxides are designated under total control at present, and in the future nitrogen oxide pollution will be investigated. A technique of forecasting such pollution will be established soon. The designated areas for control are those where factories or business facilities are congested. At present 11 areas are so designated. Specially designated factories are those which consume a minimum 0.1 kg/hr to 1.0 kl/hr of fuel. There is a 6-month grace period before necessary improvements are enforced. Offenders are prosecuted in accordance with Article 241 of the Criminal Case Prosecutiion Law. The prefectural governor can issue orders to enterprises regarding emission control treatment, fuel usage, or other necessary measures. It is obligatory to monitor sulfur oxide emissions by the measurement method designated by the director of the Environmental Agency.

52752 **APTIC NO. 74572**

Utsunomiya, M.

CONCEPTION OF CONTROL BY TOTAL EMISSION FOR AIR POLLUTION. *(Taiki osen no soryo kiseino kangaekata). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(4):293-302, 1975.*

Air pollutant concentrations have genrally been reduced since emission standards were issued. In addition to the national environmental standard for sulfur dioxide, local governments have set their own environmental standards suitable for specific areas. The concept of total emission control was introduced in 1973 because increases of stack height cannot prevent the increase of total emission and the affected area may increase even though the ground concentration decreases and K values, must be revised when the number of polluting facilities increases. The original total emission control act introduced the simulation method for air pollution forecasting and only those areas such as industrial complexes and overcrowded areas are subject to control. The control standard is based on individual plants and the allowable concentration is determined by total fuel consumption and maximum compounded ground concentration from the smoke producing facilities.

52753 **APTIC NO. 74956**

Wolter, D. and H. Heinrich

CONTRIBUTION OF THE AEROHYGIENIC ASSESSMENT OF DRY-CLEANING PLANTS. *(Beitrag zur Lufthygienischen Beurteilung von chemischen Reinigungsanlagen). Text in German. (Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(1):29-31, 1975. 2 refs.*

The detrimental effect of the improper discharge of exhausts from dry-cleaning plants many present a hazard to public health in the immediate neighborhood, due to the high emission of tri- and perchloroethylene and benzene is discussed. Over a 15-min period during the working day, the maximum allowable emissions level may be exceeded up to 180 times. Suggestions are made that the sites of dry-cleaning plants and the methods employed for discharging airborne harmful substances be inspected; that trichloroethylene by converted to perchloroethylene; and that the selection of new sites be approved by public health authorities, following a thorough examination of current emission standards.

52754 **APTIC NO. 74385**

THE 1975 PRIORITY POLICY IN THE INDUSTRIAL POLLUTION CONTROL OFFICE OF THE MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY. *(Showa 50 nendo Tsusansho Ricchi Kogai kyoku no juten shisaku). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), vol. 1975:20-29, March 1975.*

The 1975 administrative policy concerning industrial location is reviewed with reference to the budget, capital investment, and tax system. The industrial relocation policy is explained with a description of the subsidizing system for relocation cost and interest cost to cover the development of industrial residential areas and related capital investment systems. The policies concerning the promotion of improvement in industrial environments and introduction of industries into rural areas are described. The industrial water policy concerning industrial water supply, efficient use of industrial water, search for new water supply sources, and land subsidence control is also described. Control policies including the investigation system of industrial pollution, the development of forecasting procedures for industrial pollution, the treatment of industrial waste, efficient use of natural resources, industrial pollution consulting agencies, guidelines for industrial pollution control, economic studies of pollution activity, and subsidizing systems for pollution control are discussed. With respect to industrial safety policy, the handling of high pressured gases, LPG (liquefied petroleum gas) and explosives, and safety in the mining industry are discussed.

52755 **APTIC NO. 74387**

ON THE ASSESSMENT OF THE PLANT LOCATION. *(Kojo richi asesumento ni tsuite). Text in Japanese. In: Ministry of International Trade and Industry, Industrial Location Environmental Bureau (Japan), p. 1-17, May 22, 1975.*

The recent trend in environmental assessment is reviewed. The necessity of environmental assessment as a preventive measure for environmental pollution, particularly concerning industrial plant location, present regulatory systems of environmental assessment by laws and municipal agencies, and thee policy of the Environment Agency and other ministries concerning environmental assessment are discussed. The environmental assessment program of the Ministry of International Trade and Industry is described. Based on the plant location law (revised version of present law), this conception was formulated and applied to plants with maximum emission quantity of exhaust gas exceeding 300,000 N cu m/hr and maximum discharge quantity of waste water exceeding 100,000 cu m/day. The enforcement organization of environmental assessment and its functions are discussed. Descriptions of environmental assessment, evaluation standards, assessment procedures, and industrial plant location assessment schedules are also given.

52756 **APTIC NO. 74501**

PRIME MINISTER S ORDINANCES FOR THE PARTIAL AMENDMENT OF AIR POLLUTION CONTROL LAW ENFORCEMENT REGULATION. *(Taiki osen boshi ho shiko kisoku no ichibu o kaisei suru sorifurei). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 10(3):97-98, May 1975.*

In accordance with the Air Pollution Control Law, Article 3, Item 1 and Article 30, Item 2, the Air Pollution Control Law Enforcement Regulation was partially amended. The amendment of Article 3 of the Air Pollution Control Law Enforcement regulation concerning the sulfur oxides concentration (determined according to JIS K0103), emission quantity of flue gas (JIS Z8808), and sulfur content of fuel (JIS K2273, K2547, K2541, K2263) is given in tabular form. The supplementary provisions concerning effective dates of amendment, K value in Article 3, Item 1, and the SOx emission standard are also given.

52757 **APTIC NO. 74717**

Sendai Municipal Office, Bureau of Public Health

AIR POLLUTION CONTROL COUNTERMEASURES. *(Taiki osen boshi taisaku). Text in Japanese. In: 1974 White Paper on Environmental Pollution, p. 133-135, 1975.*

Since December 1971, sulfur oxides and airborne dust have been monitored at 9 locations in Sendai, Japan. In 1973, yearly average values of sulfur oxides ranged from 0.006-0.013 ppm. Revised 24-hr environmental standards were met. However, hourly values exceeding 0.1 ppm were recorded. In the winter of 1971, 4.9 sq km of central city, where 168 enterprises are located, were directed to burn fuel of less than 1.5% (average) sulfur content. Total emission standards for Sendai were established after consultation with Miyagi Prefecture, at 90 tons/yr/2 sq km. Observed SOx emission values in Sendai are 2000 N cu m/hr, so environmental standards should be met. Photochemical oxidants have been monitored at 5 locations in the city by telemetry. Maximum hourly values have ranged from 0.08-0.14 ppm, and values frequently have exceeded the standard hourly value of 0.06 ppm. The alert standard for oxidants is 0.15 ppm. On-site inspection laws for checking pollution from factories and businesses have been strengthened. Temperature measurements at altitudes of 130 m, 170 m, and 220 m are being taken, and continuing inversion layer studies are under way.

52758 **APTIC NO. 74750**

Shizuoka Prefectural Government (Japan)

OFFENSIVE ODOR CONTROL. *(Akushu boshi taisaku). Text in Japanese. In: Environmental White Paper in 1974, p. 367, 1975.*

The malodor control law was issued in June 1971 and put in effect in May 1972. In Dec. 1973, eight cities were designated as control areas, and presently 22 municipalities are designated in Shizuoka Prefecture; 13 more municipalities are to be added to the designated area list in March 1975. Some of the projects undertaken are a survey of malodor emission sources, effects of deodorization devices, acquisition of measurement instruments, and training of technical personnel. Based on the malodor control ordinance, the registration of industries with possible malodor emission source and control standards for the maintenance of such facilities are enforced.

52759 **APTIC NO. 74789**

Environmental Agency (Japan), Planning and Co-ordination Bureau, Research Co-Coordination Div.

TREND OF THE ENVIRONMENTAL PROTECTION RESEARCH IN THE NATIONAL RESEARCH ORGANIZATIONS. *(Kikuritsu shikenk kenkyu kikan ni okeru kankyo hozen kenkyu no doko). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(4):217-223, April 1975.*

Research on air pollution prevention conducted at various national institutes included overall studies of photochemical smog prevention at large cities, development of non-pollution automobiles, and evaluations of new pollutants and their prevention. Research activities currently being conducted are: basic function of traffic systems for automotive air pollution prevention; effects of complex air pollutants on living organisms; measurement methods of air pollutants including aerosols; elucidation of photochemical aerosol formation mechanism; prevention techniques for nitrogen oxides from stationary sources; removal of hydrocarbon vapor by ceramic adsorption material; physical measurement of micro-quantities of harmful substances in air; development of sound wave radar for air pollution monitoring; and measurement of particulates in air during photochemical smog.

52760 **APTIC NO. 74810**

Shizuoka Prefectural Government (Japan)

SETTLEMENT OF ENVIRONMENTAL POLLUTION COMPLAINTS, DISPUTES. *(Kogai kujo funso no shori). Text in Japanese. In: Pollution White Paper in 1974, p. 304-313, 1975.*

Pollution complaints for 1973 in Shizuoka Prefecture are tabulated and described. A total of 2403 compliants were received by the authorities in 1973, an increase of 256 cases from 1972. Most of the complaints were received about noise (680) followed by water quality deterioration (549), atmospheric pollution (528), malodors (417), vibrations, and other complaints. There has been a sharp, continuous rise in complaints about water quality since 1969. Vibration complaints have diminished somewhat after reaching a peak in 1971. Five cities (Shimizu, Hamamatsu, Fuji, Shizuoka, Numazu) provided 50.7% of the total complaints. Most complaints occurred between May-July of each year. Most noise complaints occurred in July, when windows were open. Of complaints which needed disposition, 83,1% of the cases were settled. However, only about 77% of noise and vibration complaints were settled.

52761 **APTIC NO. 74900**

ENVIRONMENTAL POLLUTION: TREND OF THE AIR POLLUTION CONTROL. *(Kogai; taiki osen taisaku no doko). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 54(579):569-572, 1975.*

Administrative aspects of air pollution control are described with a presentation of the variation of atmospheric pollution levels in past years for sulfur dioxide and nitrogen dioxide. The SO2 pollution has been decreasing every year since 1969 in spite of the increasing heavy oil consumption. The yearly average of SO2 at 16 major monitoring stations in 1969 was 0.055 ppm; this decreased to 0.030 ppm in 1973. Of 685 monitoring stations in 248 cities, 34% met the SO2 environmental standard in 1972; this figure increased to 46% in 1973. The NO2 pollution has been increasing every year. The yearly average was 0.0227 ppm in 1968 and 0.0293 ppm in 1973. Only 4 monitoring stations out of 228 met the NO2 environmental standard (0.02 ppm in 1-hour average) in 1973. Carbon monoxide pollution, originating mostly from automobile exhaust gas, has been decreasing every year since its peak in 1969. All of the 70 stations in 47 cities met the CO environmental standard in 1973 except one station. Total emission control for SO2 was newly imposed in June 1974. In 1975, the SO2 emission standard was strengthened and 8 rankings for the K value were adopted. As the result of this new ranking, 25% tighter SO2 standards were enforced in 67 areas. The 1976 automobile exhaust gas control regulations will require nitrogen oxides emission to be less than 0.84 g/km for the automobiles manufactured from 1976 and weighing less than 1000 kg. Oxidant monitoring stations have been established through Japan; there were 425 stations as of March 1974.

52762 **APTIC NO. 74990**

Shizuoka Prefectural Goverment (Japan)

VARIOUS POLICIES FOR ENVIRONMENTAL POLLUTION CONTROL. *(Kogai boshi no sho shisaku). Text in Japanese. In: Pollution White Paper in 1974, p. 353-361, 1975.*

Application of the 1974 sulfur dioxide standards, and various air pollution countermeasures in Shizuoka Prefecture, Japan, are discussed. Old emission standards (K values) for sulfur oxides, depending on the locality, ranged from 7.59-22.2. New standards range from 1.75 to 17.5. Maximum ground concentrations are proportional to K values: a K value of 1.75 is equivalent to 0.003 ppm. There are about 239 factories and 300 facilities in the prefecture which do not meet the new standards. Computer simulations are being conducted to determine total amount emission standards in the Fuji region. Air pollutant monitoring has been expanded throughout the prefecture, and telemetry facilities are being improved. A warning network for photochemical oxidant emergency announcements has been established for 16 regions. Regular televison and radio times for oxidant announcements have been established for the months of June through September. In June 1973, damages were reported from acidic rain (pH 2-3) of unknown origin, occurring in the central region of the prefecture.

52763 **APTIC NO. 76667**

Long Island Lighting Co., Mineola, N. Y.

PROPOSED SELECTIVE EMISSIONS LIMITATIONS SYSTEM FOR LONG ISLAND LIGHTING COMPANY BASE-LOAD GENERATING UNITS NASSAU AND SUFFOLK COUNTIES, NEW YORK. *Engineering Rept. EN-1397, 89p., Feb. 1975. 9 refs.*

A selective emissions limitation system for the Long Island Lighting Company s electrical generating units in Nassau and Suffolk Counties is proposed which is based on switching to low sulfur oil or coal under specified conditions. Descriptions of diffusion modeling for emissions generated from the two units, monitoring equipment and locations for sulfur dioxide and meteorological parameters, and fuel switching procedures are provided. The proposal calls for the prompt conversion to lower sulfur fuel whenever any combination of SO2 monitors assigned to the facilities indicate SO2 levels of 0.1 ppm for 4 consecutive hr or 0.2 ppm for 2 consecutive hr. The facility must continue to fire low sulfur fuel until all of its monitors indicate less than 0.07 ppm for 2 consecutive hr. Monthly and semi-annual reports must be submitted to the appropriate control authorities.

1974

52764 **APTIC NO. 74444**

Becher, J. and H. Strenge

SOCIALIST RELATIONS OF PRODUCTION AND ENVIRONMENTAL PROTECTION. *(Sozialistische Produktionsverhaeltnisse und Umweltschutz). Text in German. Technik (Berlin), 29(6):357-359, June 1974. 17 refs.*

Problems and possibilities of environmental protection under socialist production conditions are outlined. As opposed to capitalistic countries where effective environmental protection is hindered by the inherent underlying principles of free enterprise, profit-mindedness, and competition, the socialist relations of production in communist countries permit optimum proportions between the growth of the gross national product and consumption of material goods by society. Sensible and effective environmental protection is incompatible with the reckless exploitation of natural resources. Socialist enterprises should be encouraged to develop ecologically adequate technologies and products by the increased use of economic incentives and bonuses with respect to environmental concerns.

52765 **APTIC NO. 74351**

Ikeo, Takayoshi

ENVIRONMENTAL RIGHT AND JUSTICE. *(Kankyoken to Saiban). Text in Japanese. Preprint, Science Council of Japan, 8p., 1974. (Presented at the Environmental Protection and Scientific Conference, 2nd, Tokyo, Japan, June 1974.*

Legal action taken against environmental polluters in Japan is reviewed. The Hiroshima district court in May 1971 declared that a solid waste treatment plant was responsible for causing odors in the area. The Hiroshima high court in February 1973 upheld the district court decision. Similar decisions were made by district courts in other areas. Lawyers for the victims of air and noise pollution generated by Osaka Airport introduced a new health concept which included both physical and social considerations.

52766 **APTIC NO. 74569**

Inaba, Minoru

DEVELOPMENT OF LOW-NOX COMBUSTION METHODS. *(Tei NOx nenshoho no kaihatsu ni tsuite). Text in Japanese. Japan Assoc. for Thermal Energy Technology, 6p., 1974. (Presented at the Japanese-American Symposium on NOx Countermeasures for Stationary Sources, Tokyo, Japan, June 28-29, 1974.)*

The Japanese government has established a 5-year plan for developing nitrogen oxide control techniques at emission sources. To supplement the project, systems for financial aid, loans, and tax exemptions are proposed. The research includes studies on the NOx formation mechanism and NOx behavior in the air; studies of measurement techniques, NOx formation control techniques (combustion improvements), and NOx elimination techniques (stack gas treatment techniques). One of the most comprehensive research projects, with a budget of about $1,790,000, is a study on the control of photochemical smog and urban composite air pollution. Research projects include: photochemical reaction mechanisms; the effects of photochemical smog on humans, animals, and plants; traffic control; emission control techniques (NOx and hydrocarbons); and measurement and analytical techniques. The research work on denitrification is also expanding among private industries, and more than 30 methods have been published by large concerns; most of them are still in the pilot plant or bench-scale stage.

52767 **APTIC NO. 74934**

Nakamura, H., T. Fuse, and M. Iguchi

ONE TECHNIQUE OF ENVIRONMENTAL ASSESSMENT OF A TRAFFIC FACILITIES INVESTMENT PLAN. *(Kotsu shisetsu toshi keikaku ni kakaru kankyo asesumento no ichi shuho). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, Vol. 4, 276-277, 1974. (Presented at the Japan Society of Civil Engineers, Lecture, Meeting, 29th, Tokyo, Japan, 1974.0*

An environmental assessment was made using the traditional cost-effect analysis. A new bullet train plan, taking into account the concept basic plan improved plan and actual execution stages, is presented for each stage, an alternative plan should be made for environmental assessment, using three criteria: the forecasting and evaluation of environmental changes which would occur during development, and the establishment of emissions standards for each environmental factor.

52768 **APTIC NO. 74484**

Namiki, Akio

CITY PLANNING AND ENVIRONMENTAL PROBLEMS ASSOCIATED WITH TRANSPORTATION. *(Toshi keikaku to kotsu kankyo mondai). Text in Japanese. Unyu to Keizai (Trans. Econ.), 34(12):27-34, Dec. 1974.*

Environmental pollution due to transportation is discussed in relation to urban planning. Basic policies of environmental pollution control associated with transportation include the maximum utilization of automotive transportation within the socially permissible range with emphasis on the modification of automobiles and regulation of traffic volume. To restore the environment in residential areas affected by major highways and heavy traffic, a program for creating a safe living environment was formulated. A model plan for the construction of an environmental zone is described. An overall evaluation of air pollution in Tokyo and the necessity of new urban planning theories are also discussed.

52769 **APTIC NO. 74446**

THE GOAL FOR THE AUTOMOTIVE EXHAUST GASES NOX REGULATIONS. *(Jidosha haigasu no NOx kisei no yukue). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(9):52-55, Sept. 1974.*

Two public hearings were held on air pollution by nitrogen oxides from fixed sources such as power plants and moving sources. Both hearings were sponsored by the Environmental Protection Agency. The first public hearing, which many major manufacturers attended, was on flue gas denitrogenation techniques. Sumitomo Chemical Co. reported that a test plant (capacity 200,000 cu m/hr) was completed for catalytic reduction with ammonia. Hitachi Ship Building Co., Mitsubishi Heavy Industry Co., and Fuji Kasui Co. also reported developments of new techniques leading to 90% and 100% denitrogenation. The achievements were farther advanced than was expected by the agency. The second hearing was on moving sources, i.e., automobiles. Nine auto makers attended the hearing during which the agency was criticized. Since no regulation was given before 1970 for NOx emission standards were impossible to meet and refused to release any data. By the request of the director of the Japanese EPA, data were obtained after the hearing. The data showed that no maker could achieve the 1971 goal but all were willing to minimize NOx emission to from 0.6 to 1.1 g/km.

52770 **APTIC NO. 74520**

Meguro Ward Office, Tokyo (Japan), Construction and Public Nuisance Div.

HAZARDOUS GASES. *(Yugai gasu). Text in Japanese. In: Environmental Pollution in Meguro Ward, p. 91-93, Dec. 1974.*

The present status of noxious gas regulations and countermeasures for noxious gases are described for Meguro Ward, Tokyo. According to present Metropolitan Tokyo Pollution Control Regulations, there are 32 kinds of noxious gases under regulation, with permissible concentrations ranging from 1 ppm for sulfuric acid, including sulfur trioxide, to 200 ppm for nitrogen oxides, and total concentration combinations for certain organic compounds. In Meguro Ward in 1973, seven types of enterprises (plating, dry-cleaning, paint, filament, Alumite, dry-copying, fertilizer) produced eleven kinds of hazardous gases (ammonia; hydrogen cyanide); hydrogen chloride; nitrogen oxides; sulfuric acid (including sulfur trioxide); chromic acid; toluene; xylene; methyl, ethyl, and butyl acetates; trichloroethylene; and tetrachloroethylene). When complaints occur, or when permission is given by the factory, the Ward issues three guidelines: improve or install equipment to noxious gases at their sources; make certain that equipment is kept in good working order; and switch to other processes when noxious gas control is difficult.

52771 **APTIC NO. 74521**

Meguro Ward Office, Tokyo (Japan), Construction and Public Nuisance Div.

OFFENSIVE ODORS. *(Akushu). Text in Japanese. In: Environmental Pollution in Meguro Ward, p. 85-90, Dec. 1974.*

A description and present status of malodors and malodor countermeasures are explained in simplified terms for the layman. In Meguro Ward, Tokyo, there have been 114 malodor complaints in 1973, out of a total number of about 500 complaints. There are malodor regulations for five substances (ammonia, methylmercaptan, hydrogen sulfide, methyl sulfide, trimethylamine), but these substances are more products of agricultural and biological processes than petroleum chemistry. At present, Metropolitan Tokyo itself does not have malodor ordinances. Meguro Ward regulates high malodor concentrations as noxious gases, and low malodor concentrations, which are not covered by the noxious gas regulations, with administrative guidelines. Once the sources and amounts of problem-causing odors are found, malodors should be eliminated by use of closed systems, process changes, and deodorization installations (washing, adsorption, neutralization, combustion, and catalytic oxidation).

52772 **APTIC NO. 74687**

Kumamoto Prefectural Government (Japan), Bureau of Public Health

OFFENSIVE ODOR. *(Akushu). Text in Japanese. Kumamoto ni Okeru Kogai Chosa Hokoku (Survey Report on the Environmental Pollution in Kumamoto City), no. 8:215-218, July 1974.*

There were 34 complaints of malodors at Kumamoto in 1973, including 8 concerning animal stalls and 7 concerning organic solvents and petroleum. The malodor prevention law issued on May 31, 1972 listed ammonia, methylmercaptan, hydrogen sulfide, methyl sulfide, and trimethylamine as the odorous substances requiring control. The control standards of the five odors were given as 1.0 ppm, 0.002 ppm, 0.02 ppm, 0.01 ppm, and 0.005 ppm respectively. Relocation of stalls to the rural areas was recommended as a measure for odor prevention in the city.

52773 **APTIC NO. 74701**

GOVERNMENT ORDINANCE TO DECIDE DATE OF ENFORCEMENT OF PARTIAL AMENDMENTS TO AIR POLLUTION CONTROL LAW. (ORDINANCE NO. 374). GOVERNMENT ORDINANCE FOR THE PARTIAL AMENDMENT OF AIR POLLUTION CONTROL LAW ENFORCEMENT ORDINANCES (ORDINANCE NO. 375). *(Taiki osen boshiho no ichibu o kaisei suru horitsu no shiko kijutsu o sadameru seirei (Seirei Dai 374-go). Taiki osen boshiho shikorei no ichibu o kaisei suru seirei (Seirei Dai 375-go)). Text in Japanese. Kanho (The Official Gazette), no. 14373:2, Nov. 27, 1974.*

The texts of Japan Government Ordinance No. 374, and Ordinance No. 375 are reproduced. Government Ordinance No. 374 sets the date of enforcement of regulations (Law No. 65, 1974), partially amending the air pollution control regulations, to be put into effect November 30, 1974.

52774 **APTIC NO. 74744**

Kanagawa Prefectural Government (Japan)

ON THE ENVIRONMENTAL POLLUTION CONTROL ORGANIZATIONS. *(Kogai boshi soshikito). Text in Japanese. In: Environmental White Paper in 1974, p. 40-47, Dec. 1974.*

The environmental pollution control administrative organization in Kanagawa Prefecture is described. The first pollution control department was organized in April 1958 and after many reorganizations the present bureau of pollution control was established in April 1971. The bureau of pollution control consists of three departments and a pollution control center staffed with 265 personnel. The environmental pollution control headquarters established in 1970 functions as the coordinator of various agencies and offices. The organization and activities of the bureau are described along with those of auxiliary agencies.

52775 **APTIC NO. 74746**

Kanagawa Prefectural Government (Japan)

PHOTOCHEMICAL POLLUTION CONTROL. *(Kokagaku Kogai Taisaku). Text in Japanese. In: Environmental White Paper in 1974, p. 167-169, Dec. 1974.*

A photochemical smog forecasting system was introduced in Kanagawa in June 1971, and regular forecasting was initiated in April 1972. The description of three pollution types forecasted type of forecasting, forecasting standards, control procedures to be taken in the case of forecasted photochemical smog, and communication systems are given. In the case of photochemical smog emergency, the major nitrogen oxides and hydrocarbon emission sources are notified and emergency procedures are put into effect. The photochemical smog research system consists of the photochemical smog control project team and photochemical smog control work group, which have been engaged in the study of formation mechanisms of photochemical smog and its effects on humans and plants.

52776 **APTIC NO. 74747**

Kanagawa Prefectural Government (Japan)

ENVIRONMENTAL MONITORING. *(Kankyo Kanshi). Text in Japanese. In: Environmental White Paper in 1974, p. 153-161, Dec. 1974.*

In Kanagawa Prefecture concentrations of sulfur oxides, suspended particulate, nitric oxide, nitrogend dioxide, carbon monoxide, hydrocarbons, and oxidant and meteorological conditions such as wind direction, wind velocity, temperature, and humidity measured at 72 measuring points are compiled at the central monitoring bureau of telemetry and data are processed by a computer system for instantaneous forecasting or emergency warning. The processed pollution data are analyzed with reference to the data of three surrounding prefectures for overall pollution evaluation. In the event of pollution forecasting or emergency, the designated factories (63 factories emitting SOx and 109 factories emitting oxidant) are notified simultaneously, and the emergency control procedures are put into effect immediately. A flow sheet of the emergency communication system and a list of 72 pollution monitoring stations are given.

52777 **APTIC NO. 74748**

Kanagawa Prefectural Government (Japan)

REGULATIONS BY LAWS AND GOVERNMENT ORDINANCES. *(Horitsu jyorei ni yoru kisoku). Text in Japanese. In: Environmental White Paper in 1974, p. 148-153, Dec. 1974.*

The basic pollution control laws in effect in Kanagawa Prefecture are the airr pollution control law, the road transportation vehicle regulation, and the pollution control ordinance. The air pollution control law concerns the emission of smoke and particulate matter and 8652 facilities emitting smoke and 532 facilities emitting particulate matter come under this law as of March 1974. The K value control standard is used for sulfur oxides, and particulate matters and toxic substances such as cadmium, lead, and chlorine are controlled in terms of emission concentration. The calculation method for K value is described. According to a survey conducted in the Tokyo bay area in 1972, the amounts of air pollutants attributable to automotive exhaust gas are hydrocarbons 57.3%, nitrogen oxides 39.0%, and carbon monoxide 93.0%. The 1973 and 1975 emission standards for CO, HC, and NOx for various types and sizes of vehicles indicated in the road transportation vehicle regulation are given. In the pollution control ordinance, the R value based on the amount of heavy oil consumption and emission quantity of SOx from combustion sources other than those using heavy oil is used. It is also used for particulate matter.

52778 **APTIC NO. 74749**

Kanagawa Prefectural Government (Japan)

MONITORING SYSTEM FOR POLLUTION SOURCES. *(Hasseigen Kanshi). Text in Japanese. In: Environmental White Paper in 1974, p. 162-167, Dec. 1974.*

The factories registered in compliance with the law and operating with permits are inspected periodically and at times of emergency for possible violations and execution of proper emergency procedures. The amount of fuel consumption, sulfur content in fuel, and pollutant concentration at the emission source are checked. In Kanagawa Prefecture, the air pollution emergency procedure for each pollutant was formulated in June 1972. A pollution forecast, warning, alert, and emergency alert are issued for each pollutant and the emergency procedures are enforced in order to prevent the progress of pollution. The numbers of registered emission sources of sulfur oxides, nitrogen oxides, and hydrocarbons (concerning oxidant) are compiled. As for SOx, no forecasting or warning was issued in 1973. The concentration standards of each pollutant for the issuance of forecasting, warning, alert, and emergency alert are described.

52779 **APTIC NO. 74780**

Itami City Office (Japan), Osaka Prefecture

MONITORING NETWORK FOR AIR POLLUTION. *(Taiki osen no sokuteimo). Text in Japanese. Kogai No Gaikyo (The Outline of Pollution), p. 15, Dec. 1974.*

Equipment and installations used by Itami City, Japan, to determine atmospheric pollutants are described. Automatic determination of atmospheric sulfur oxides, airborne particulates, wind direction, wind velocity, nitrogen oxides, and photochemical oxidants is conducted at one monitoring location. Data are sent by telemetry to the central prefectural monitoring station, and forecasts, warnings, alerts, and maximum alerts on photochemical oxidant and sulfur oxides concentrations are issued, when necessary, to factory pollution sources. Automobile exhaust emissions (carbon monoxide, nitric oxide, nitrogen dioxide) are automatically measured at a monitoring location, and these data are sent to the central monitoring station. Since April 1964, at six monitoring locations, sulfur oxides (by the lead dioxide method) and precipitated soot (by deposit gauge) have been collected and measured monthly. A mobile atmospheric pollution monitoring unit has been in operation since March 1971 at various designated locations in the city.

52780 **APTIC NO. 74879**

Tokyo Metropolitan Government (Japan)

STENOGRAPHIC RECORDS OF COMMITTEE ON ENVIRONMENTAL PROTECTION AND CAPITAL CITY DEVELOPMENT. NO. 48. *(Kogai Shuto Seibi Iinkai Sokkiroku, Dai-48 go). Text in Japanese. 10p., Dec. 12, 1974.*

Proceedings have been recorded of a meeting in which members of the 7 Metropolitan Cities Investigative Commission gave testimony on results of exhaust gas measurements on new automobiles outfitted with low pollution equipment. A discussion of proposed 1976 automobile emission standards was also held. Members of the Environmental Agency and the Central Committee for Examination of Pollution Countermeasures were invited to attend, but declined for various reasons. Complaints were voiced by the members of the 7 Cities Commission on lack of cooperation given them by the Central Committee, in questioning and establishing on a factual basis, realistic emission standards, especially for nitrogen oxides. Members of the Metropolitan Environmental Committee were critical of the sniping between the 7 Cities Commission and the Central Committee. They questioned the effect of 1976 NOx emission standards (0.25 g) on drivability of cars, jobs (layoffs due to model changeovers, realistic lead-time), fuel consumption, and cost. Three automakers, Toyo Kogyo (Mazda), Mitsubishi, and Honda furnished data to the 7 Cities

Commission on a total of ten automobile models which have met 1975 emission standards for carbon monoxide, hydrocarbons, and NOx, and which are on the market. The unresolved question is whether any of these models can be modified in time to meet the 1976 NOx emission standards, and if so, what are the ramifications. Modifying and/or lowering speed limits for cars now on the road, to reduce HC and CO emissions, were proposed. The consensus of the members of the 7 Cities Commission was that in any case, the two-year extension granted the 1976 NOx emission standards must be the final extension, and the interim NOx standards (0.6-0.8 g) must not become the final standard.

52781 **APTIC NO. 74985**

Tokyo Metropolitan Government (Japan)

STENOGRAPHIC RECORDS OF COMMITTEE ON ENVIRONMENTAL PROTECTION AND CAPITAL CITY DEVELOPMENT. NO. 49. *(Kogai Shuto Seibi Iinkai Sokkiroku, Dai-49 go). Text in Japanese. 18p., Dec. 13, 1974.*

Proceedings have been recorded of a meeting in which pollution matters affecting Metropolitan Tokyo were discussed. Those in attendence included members of the Pollution Bureau and the Capital City Development Bureau. Committee members were critical of the Pollution Bureau for either being too stringent or too lax in the enforcement of pollution standards. Pollution Bureau members explained how lack of trained personnel, money, and enforcement standards has hampered their efforts. Pollution Control Loan Funds for 1974 in Metropolitan Tokyo totaled $2.7 million for equipment improvement and $1.7 million for moving expenses. Automobile service centers are eligible for loans at 4% interest to invest in automobile hydrocarbon monitoring equipment necessary in January 1975. Disposal of mercury and other heavy metals through the sewage system, disposal of sludge, and dyes in rivers from textile mills were debated. Committee members argued that although dyes in rivers are an eyesore, they are not toxic, and forcing small to medium-sized businesses to spend $15,000 on improved equipment would drive many out of business. Pollution Bureau members cited cooperative ventures as a solution to the problem, although not always feasible, according to Committee members, because of cost and relocation problems. Committee members wondered, once HC emissions were checked, what means there were for enforcement of standards and who pays the costs.

52782 **APTIC NO. 75000**

NEED FOR A REEVALUATION OF LARGE-SCALE INDUSTRIAL DEVELOPMENTS AND ENVIRONMENTAL POLLUTION PROBLEMS. *(Saikento semarareu ogata kogyo kaihatsu to kankyo kogai mondai). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(8):46-52, July 1974.*

The Japanese soda industries had been in the process of changing over from the mercury technique of production to the diaphragm method in order to avoid mercury pollution, at a tremendous cost. Then the news of the 100% Dow Chemical capital-backed caustic soda and chlorine electrolysis plant constructions in East Tomakomai brought shock and panic. On the other hand, the general government development plan for new large-scale industries in several selected areas of Japan, which has been initiated in May 1969, were met by such rabid opposition of residents in all areas that the issues have been turned into political planks. These industrial plans were to develop iron and steel, petroleum refining, petrochemicals, and non-ferrous metals with projected production figures of more than four billion dollars in 1980 and more than 11 billion dollars upon the completion of the plan in 1985. But by 1972, the advice was given by the investigation committee of the Suho Sea Development Plan that the idea be postponed at least, and the Central Pollution Control Council is now recommending that if the highest and newest technology cannot prevent pollution problems attendant upon these industrial development plans, the production process, production scale, or products themselves be changed, and if necessary, the entire development plan be stopped. The revised plans for 1972 to 1975 now have to deal with the problems of large urban developments, industrial site selections, agricultural, forestry, and marine industries, natural environment protection, land expansion, traffic and communication networks, and these problems must be coordinated with other economic plans.

1973

52783 **APTIC NO. 74392**

Suginami Ward, Tokyo Metropolitan Government (Japan) Div. of Environment

ANNUAL PROCEEDINGS OF THE ENVIRONMENTAL POLLUTION MONITORING COMMITTEE OF SUGINAMI WARD IN 1973. *(Suginami-ku kogai kanshi iinkai ichinen no ayumi). Text in Japanese. 70p., 1975.*

The regulations of the Environmental Pollution Monitoring Committee of Suginami Ward, managerial regulations, and a list of committee members are presented. The proceedings of 12 monthly committee meetings held during the period of April 1973 to March 1974 are given. The letter of request sent to the director of the Environment Agency concerning automotive exhaust emission control; the letter sent to the governer of Tokyo concerning the toxic substances contained in flue gas emitted from the Suginami refuse treatment plant and control measures; the governer s response and the response for the office of the Suginami refuse treatment plant with analysis data of waste water; flue gas and emission data and flow sheets of heavy metal sedimentation systems andd hydrogen chloride removal devices; letters of request sent to the director of the Environment Agency concerning air and environmental pollution control measures; letters of request sent to the headman of Suginami ward concerning pollution control administration and environmental protection; and survey data of air pollution aloeg Koshu highway are also given with the proceedings of special committee meetings and meetings with Suginami residents.

52784 **APTIC NO. 74393**

First Inspection Party for Environmental Control in Europe

REPORT OF ENVIRONMENTAL PROTECTION STUDY MISSION TO EUROPE. *(Oshu kankyo hozen shisatsudan hokoku). Text in Japanese. Osaka City Government and Osaka City Pollution Prevention Association (Japan), 72p., Nov. 1973.*

In Nov. 1973, a 24-member group consisting of the officials of Osaka City Government and members of the Osaka City Pollution Prevention Association traveled to five European countries. The city hall in Reading, Britain and Duesseldorf, Germany, the sewage treatment plant in Reading, La Defense France and Duesseldorf, an incinerator in Duesseldorf, the Essen Institute of Technology in Germany, and an industrial waste processing plant in Rotterdam, Holland were visited in 13 days. At the two city halls visited, information on environmental pollution, pollution control administrative policy, and pollution control administrative system was gathered. At the Essen Institute, information on the project concerning environmental pollution control technology was gathered. Reports of all the other facilities visited are given with descriptions of the facility, operational data, and pollution control measures taken.

1972

52785 **APTIC NO. 74897**

Ishikawa, Hajima, H. Brown, J. G. Faugere, Michio Hashimoto, E. Keller, J. N. Pitts, and J. J. Schueneman

FUTURE OF AIR POLLUTION AND ITS CONTROL. (Taiki osen oyobi so no boshi no shorai). Text in Japanese. Enjiniyasu (Engineers), no. 292:5-12, Dec. 1972.

Problems of air pollution measurement are discussed as well as the design of a boiler capable of complete combustion. International regulations for the control of pollution are also discussed. The importance of oxidants in photochemical smog formation are considered. The need for establishing an environmental organization at the United Nations is stressed. Already the cooperation of 20 nations has been sought for interdisciplinary study. The need to explore more fully the effect of nitrogen dioxide on human health is also discussed. The cost of air pollution control and the need for recycling wastes to provide fuel for smaller plants is considered.

52786 **APTIC NO. 74898**

Kurokawa, M.

OUTLOOK ON POLLUTION CONTROL MEASURES. *(Kogai taisaku no tenbo). Text in Japanese. Enjiniyasu (Engineers), no. 292:13-15, Dec. 1972.*

The development of pollution control in Japan is reviewed. The history of pollution dates back to 1890, when the River Watarase was polluted by copper. Around 1930, Oska Prefecture established a regulation for smoke control. The Fuel Society of Japan was established in 1922. With progress in the heavy and chemical industries and transportation, damage caused by sulfur oxides and nitrogen oxides became greater. Especially great was the problem of SO2 in Yokkaichi, followed by organic mercury pollution of the rivers Minamata and Agano, and cadmium pollution of Toyoma. In 1967, the Industrial Pollution Fundamental Law was enacted, followed in 1968 by the Air Pollution Control Law. In 1971, the Japan Environmental Agency was established. Problems currently faced by Japan include: the development of analytical methods, including sampling; technology to eliminate pollution; improved energy sources and combustion methods; closed system development; modernization and dispersion of factories; the determination of environmental allowable limits; and social attitudes regarding the environment.

1971

52787 **APTIC NO. 74619**

MONITORING AND CONTROL OF AIR POLLUTION IN COOPERATION BETWEEN INDUSTRY AND AUTHORITIES IN THE ROTTERDAM AREA. *(Luftforurensninger overvakes og reguleres ved samarbeide mellom industri og myndigketer i Rotterdam-omradet). Text in Norwegian. Tidsskr. Kjemi Bergvesen Met., 31(9):17-18, Nov. 1971.*

The automatic sulfur dioxide monitoring network installed in the Rotterdam area is described. The SO2 concentrations are measured automatically by a potentiometric method using potassium bromide, bromine, and sulfuric acid. The concentration data are sent to a computer center every minute for processing and comparison with different maximum allowable and emergency levels. Whenever SO2 concentrations in excess of certain thresholds are measured, the computer center releases an alarm to reduce the SO2 emission of industries.

1970

52788 **APTIC NO. 74614**

Delcroix, Jacques

THE NATIONAL COUNCIL FOR AIR POLLUTION AND NOISE CONTROL. *(De Nationale Raad tegen de luchtverontreiniging en het lawaai). Text in Flemish. Elektriciteit, no. 142:29-38, 1970.*

The activity of the National Council for Air Pollution and Noise Control in Belgium since its foundation in 1957 is surveyed. The different groups of the Council are concerned with state- of-the-art studies on air pollution generated by industries, domestic heating, and automobile traffic, and with the elaboration of proposals for pollution and emission standards. A comparison with other countries indicates the need for more intense efforts in pollution control in Belgium, especially in the area of domestic heating and motor vehicles. The maximum allowable sulfur content in fuel oil should be substantially reduced, and related regulations should be issued for certain urban areas. Presently, even fuel oils with a sulfur content of 4% are used for domestic heating in Brussels.

SOCIAL ASPECTS

1975

52789 **APTIC NO. 74699**

Sawatari, Ichiro

AIR POLLUTION AND AREA RESIDENTS. *(Taiki osen to chiiki jumin). Text in Japanese. Koshu Eisei (Public Health), 39(3):160-164, March 1975. 5 refs.*

Community awareness of air pollution is discussed. A survey was taken of pollution awareness in May 1973, in a medium- to small- sized city (population about 140,000) near Tokyo, where there had been little city planning, uncontrolled expansion, increased use of automobiles and pollution complaints. Questionnaires were distributed to grade-schoolchildren in public schools, and a 90.3% (14,188 persons) response was obtained. Noise, vibrations, and odors ranked high (more than 50%) in the list of complaints about kind of pollution, and only about 8% listed soot and gas as air pollution problems. However, about 50% of the responses listed problems such as soiling of laundry, adverse effects on plants and paints, and other corrosive effects which are connected with soot and gas pollution. Persons living near industrial areas, and persons whose families had histories of respiratory ailments (bronchitis, asthma, emphysema), were most aware of air pollution (soot, gas). For community awareness and involvement in pollution problems, health education is considered to be of primary importance.

52790 **APTIC NO. 74953**

Tanaka, K.

THE LOGIC OF A NO-CAR SOCIETY. *(Han-kuruma shakai no ronri). Text in Japanese. Gijutsu to Ningen (Tech. Hum. Being), 4(5):86-93, March 1975.*

The societal disadvantages of automobile transportation are discussed. Photochemical smog is possibly caused by cars, and many people die of traffic accidents. The disadvantages of automobiles are mainly felt by poor people. Authough pollution caused by automobiles may be eliminated in the future, the cost will surely rise.

1974

52791 **APTIC NO. 74321**

Miyamoto, Kenichi

ENVIRONMENTAL RIGHTS ANDD POLITICAL-ECONOMICS. *(Kankyoken to seiji keizaigaku). Text in Japanese. Preprint, Science Council of Japan, 5p., 1974. (Presented at the International Environmental Protection and Scientific Conference, 2nd, Tokyo, Japan, June 1974.)*

The importance of attaching a profit motive to environmental preservation in order to prevent environmental deterioration is discussed. If the environment is considered as a free resource, that is, if the value of new materials is considered negligible compared to that of the finished products, environmental destruction will occur in the absence of factors directed toward its preservation or recovery.

52792 **APTIC NO. 74884**

Takagishi, S., K. Nishimura, and H. Takai

AUTOMOBILE TRAFFIC ON LOCAL HIGHWAYS AND THE ENVIRONMENT ALONG THE HIGHWAY (SENSE OF NUISANCE). *(Chiku doro ni okeru jidosha kotsu to endo kankyo (meiwaku ishiki) ni tsuite). Text in Japanese. Preprint, Japan Society of Civil Engineers Tokyo, Vol. 4, p. 278-279, 1974. (Presented at the Japan Society of Civil Engineers, Lecture Meeting, 29th, Tokyo, Japan, 1974.)*

The City Traffic Application Team of the Osaka Traffic Science Study Meeting conducted a 2-yr study on citizens reactions to traffic on both main roads and sub-roads (which cross main roads). Questionnaires were distributed to 1559 households and 4173 persons (above primary school age). Traffic volume, parking, start and arrival of vehicles, travelling speed, and noise were among the factors. Of 1473 households, 1051 (71%), considered traffic to be a nuisance. In three areas, 100% said they were inconvenienced. The types of nuisance were: noise (727 households, 69%), exhaust gas (521, 50%), vibration (444, 42%), parking (412, 39%), high speed (189, 18%), others (542, 52%). Along main roads, (except parking (33%)), these figures were higher. There was a high correlation between the amount of nuisance and 12-hr traffic volume. There was a clear relationship between complaints concerning noise and traffic volume, and a high correlation between complaints on exhaust and traffic volume.

52793 **APTIC NO. 74473**

Kanagawa Prefectural Government (Japan)

PUBLIC AWARENESS OF ENVIRONMENTAL POLLUTION PROBLEMS. *(Kogai mondai ni taisuru kenmin ishiki no doko). Text in Japanese. In: Environmental White Paper in 1974, p. 17-34, Dec. 1974.*

The public awareness of pollution problems was surveyed by interviewing 1500 persons selected at random during the period of Aug. to Sept. 1973. Items questioned were personal pollution affliction, type of affliction, pollutant source, future prospects of pollution problems, and desired pollution control measures. The percentage of persons afflicted with pollution problems was 48%, and 6% were afflicted seriously. The types of affliction were noise 28%, exhaust gas 14%, malodor 12% and vibration 9%. The automobile was mentioned most frequently as a pollutant source (29%). Data of affliction by symptoms were also compiled. A survey with a slightly different viewpoint than that of the awareness survey was conducted by sending questionnaires to 98 prefectural government monitors. Items surveyed were public concern for pollution problems, opinions on the role of administrative organizations and industry in pollution control, and consumers reaction to environmental pollution as by-products of the improvement in living standards. Data on the number and type of pollution complaints filed at municipal offices were compiled and analyzed.

GENERAL

1974

52794 **APTIC NO. 74438**

Iwata, M., H. Ise, H. Tsuchimoto, and G. Fukushima

POLLUTION, SAFETY, AND DISASTER PREVENTION. *(Kogai, anzen, bosai). Text in Japanese. Sekiyu Gakkai shi (J. Japan Petroleum Inst. Tokyo), 17(6):516-523, June 1974. 435 refs.*

Papers (435) concerning pollution, safety and disaster prevention published during the period of Dec. 1972 to Nov. 1973 are classified and major topics are summarized. The air pollution papers are classified into the categories of the present status of air pollution, air pollution control standards (environmental standards, emission standards), pollutant measurement methods, pollution control techniques for stationary sources (sulfur oxides, particulate matter, nitrogen oxides, hydrocarbons, and other specified substances), and pollution control techniques for mobile sources (carbon monoxide, hydrocarbons, nitrogen oxides, and smoke). The water pollution papers are classified into the categories of the present status of water pollution and water pollution control techniques (primary treatment, secondary treatment, treatment of specific waste water, ternary treatment, and analysis and testing). Other categories are refuse treatment, oceanic pollution, noise pollution, safety and disaster prevention (safety control, designing standard, testing and inspection, control measures for explosions and fire).

1973

52795 **APTIC NO. 74307**

Shinohara, Hisashi, Issei Nakamori, and Kenjiro Takeshita

DELETERIOUS EFFECTS OF NITROGEN OXIDES ON LIVING BODIES. *(Chisso sankabutsu no seitai ni taisuru yugai sayo). Text in Japanese. In: Survey and Research Report on Medical Examination Method of Pollution-Caused Health Damages, Kyushu Environmental Management Assoc., Fukuoka (Japan), p. 112-122, March 1973. 12 refs.*

The deleterious effects of nitrogen oxides on living bodies are described. The term, nitrogen oxides (NOx), is generally applied to the two compounds nitric oxide and nitrogen dioxide. In Japan, the proposed environmental standard for NO2 is below 0.002 ppm for an average 24-hour value, calculated from measured hourly values of NO2. The effects of NO in the body (bloodstream) have not been investigated very much, since NO is readily oxidized to NO2 in the atmosphere and NO does not irritate, as does NO2. Nitric oxide is 1500 times as effective as carbon monoxide combining with hemoglobin, and by forming methemoglobin, can cause convulsions and paralysis. The effects of NO2 on the respiratory include bronchitis, pulmonary edema, lowered resistance to other air passage infections, and initiation of cell reproduction. The prevention and elimination of malodorous substances is discussed. According to the enforcement ordinance for malodor control (National Govt. Ordinance No. 207), malodorous substances are defined as ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethylamine. Malodor pollution, however, cannot be eliminated by controlling five compounds, when there are so many malodorous substances. Most malodor compounds are combustible, and except for sulfur dioxide, the final oxidation products are generally odor-free. Secondary problems arise with incomplete combustion. Washing and adsorption are other deodorizing techniques, but disposal of wash liquid and adsorbent materials become problems. Combustion experiments with ethanol, n-propanol, and benzene were conducted, using city gas as the heat source. Compounds under investigation were vaporized with an air blower, and burned in a magnetic combustion tube.

Combustion for all three compounds (in vapor form) began suddenly above 600-700 C. Combustion was mostly completed around 700-800 C. The occurrence of complete oxidation (conversion to carbon dioxide and water) was not investigated, although qualitatively, complete oxidation occurs above 100 C.

1972

52796 **APTIC NO. 74932**

Kondo, J.

ISAP -72 TOKYO (PRESENT SITUATION OF AIR POLLUTION AND PROGRESS IN CONTROL TECHNOLOGY). *(ISAP-72 Tokyo (Taiki osen no genjo to boshi gijutsu no shinpo). Text in Japanese. Enjiniyasu (Engineers), no. 292:2-4, Dec. 1972.*

An International Symposium on Air Pollution-1972, held from October 17 to 19 in Tokyo is discussed. Topics which were presented included: pollution control in Japan, mathematical models of air pollution, air pollution control in the Federal Republic of Germany, air pollution control in the U. S. and photochemical smog.

52797 **APTIC NO. 74310**

Van Rysselberge, Maurice

RELECTIONS ON AIR POLLUTION. *(Quelques reflexions sur la pollution atmospherique). Text in French. J. Ingrs., 21(2):7-20, 1972. 19 refs.*

General problems of international air pollution are discussed. Sulfur dioxide, nitrogen oxides, and dust are regarded as the major air pollutants. Plants are usually more susceptible to air pollutants such as SO2 than animals and humans. Sulfur fallout as a result of SO2 emissions is a vital substance for plant growth. Nitrogen oxides are formed at high temperatures and relatively low air-excess coefficients. Coal emits the highest percentage of nitrogen oxides of all solid and gaseous fuels. The SO2 emissions can be reduced by the use of low-sulfur fuel, and fuel or flue gas desulfurization. Satisfactory dilution can be achieved by the use of high stacks. All pollutant emissions related to combustion processes can be abated by the use of environmentally favorable energy sources, such as nuclear energy. Concentration standards adopted for SO2 in the USA, Japan, France, and Sweden are presented.

SUBJECT INDEX

A

ABSORPTION (CONTROL)
52116, 52126, 52128, 52141, 52142, 52161, 52205, 52228, 52236, 52237, 52265, 52266, 52274, 52278, 52296, 52297, 52320, 52334, 52479, 52482, 52561, 52707

ABSORPTION (GENERAL)
52146, 52165, 52194, 52271, 52273, 52291, 52295, 52305, 52380

ACETALDEHYDE
52439

ACETIC ACID
52226, 52227, 52347

ACETONE
52226, 52227, 52362, 52384, 52424, 52543, 52577

ACETYLENES
52424, 52570

ACROLEIN
52405, 52424, 52439, 52475, 52635

ACUTE
52625

ADAPTATION
52614, 52625

ADSORPTION (CONTROL)
52116, 52129, 52142, 52183, 52207, 52211, 52216, 52223, 52228, 52230, 52263, 52266, 52287, 52290, 52297, 52298, 52309, 52324, 52326, 52353, 52543, 52552, 52553, 52561, 52585, 52701, 52759

ADSORPTION (GENERAL)
52153, 52206, 52271, 52273

AEROSOL DIFFUSION AND BROWNIAN MOTION
//)#)52505

AEROSOL PHENOMENA
52078, 52129, 52358, 52360, 52363, 52369, 52422, 52438, 52445, 52472, 52479, 52492, 52499, 52504, 52505, 52531, 52535, 52539, 52540, 52545, 52550, 52551, 52585, 52588, 52650

AEROSOLS
52158, 52314, 52358, 52403, 52413, 52422, 52445, 52447, 52472, 52479, 52492, 52501, 52504, 52508, 52513, 52531, 52534, 52535, 52545, 52551, 52555, 52559, 52564, 52573, 52578, 52588, 52625, 52759

AGRICULTURAL CHEMICAL PLANTS
52113, 52116, 52251, 52595, 52665, 52704

AGRICULTURAL SERVICES
52536

AGRICULTURE INDUSTRY
52076, 52458, 52536, 52772

AIR CONDITIONING EQUIPMENT
52199, 52299

AIR POLLUTION EPISODES
52390, 52413, 52421, 52448, 52452, 52497, 52514, 52602, 52623, 52675, 52720, 52727, 52731, 52742, 52749, 52762, 52775, 52776, 52778, 52779, 52787

AIR POLLUTION FORECASTING
52091, 52092, 52102, 52468, 52474, 52490, 52495, 52497, 52506, 52507, 52509, 52514, 52519, 52523, 52527, 52532, 52775, 52776, 52778, 52779

AIR QUALITY CRITERIA
52724, 52786

AIR QUALITY MEASUREMENT PROGRAMS
52056, 52076, 52091, 52100, 52102, 52105, 52107, 52240, 52330, 52376, 52390, 52398, 52411, 52413, 52414, 52415, 52418, 52420, 52421, 52422, 52424, 52425, 52426, 52428, 52431, 52433, 52434, 52436, 52437, 52439, 52440, 52441, 52442, 52445, 52446, 52447, 52448, 52452, 52453, 52454, 52458, 52467, 52469, 52470, 52471, 52472, 52474, 52475, 52476, 52477, 52481, 52483, 52488, 52490, 52496, 52500, 52510, 52511, 52513, 52514, 52519, 52520, 52523, 52525, 52530, 52535, 52537, 52580, 52582, 52583, 52584, 52586, 52590, 52597, 52598, 52599, 52601, 52602, 52608, 52609, 52610, 52613, 52619, 52623, 52624, 52626, 52630, 52632, 52647, 52648, 52651, 52653, 52655, 52656, 52662, 52668, 52669, 52670, 52674, 52675, 52676, 52677, 52678, 52679, 52680, 52681, 52683, 52684, 52686, 52691, 52695, 52697, 52702, 52703, 52709, 52720, 52728, 52740, 52741, 52742, 52744, 52746, 52749, 52751, 52761, 52768, 52775, 52776, 52779, 52787, 52792

AIR QUALITY STANDARDS
52240, 52286, 52383, 52458, 52591, 52595, 52642, 52657, 52723, 52724, 52727, 52729, 52745, 52747, 52749, 52752, 52770, 52772, 52797

AIR RESOURCE MANAGEMENT
52718, 52720, 52722, 52741, 52749, 52751, 52765, 52768, 52782, 52785, 52786, 52791

AIR-FUEL RATIO
52066, 52095, 52166, 52171, 52176, 52217, 52252, 52276, 52294, 52311, 52562

AIRCRAFT
52091, 52196, 52210, 52486, 52491, 52503

AIRPORTS
52091, 52100, 52299

ALCOHOLS
52049, 52094, 52226, 52227, 52362, 52424, 52543, 52547, 52649

ALDEHYDES
52100, 52185, 52226, 52345, 52384, 52394, 52405, 52407, 52424, 52439, 52475, 52493, 52548, 52635, 52649

ALERTS
52390, 52421, 52448, 52497, 52602, 52623, 52675, 52720, 52731, 52742, 52749, 52762, 52779, 52787

ALKALINE ADDITIVES
52084, 52117, 52144, 52147, 52152, 52169, 52174, 52179, 52181, 52194, 52197, 52248, 52284, 52295, 52305, 52310, 52560, 52730

ALLERGIES
52582, 52596

ALUMINUM
52386, 52714

ALUMINUM COMPOUNDS
52402, 52403, 52447, 52535, 52560, 52631

ALUMINUM OXIDES
52546, 52567

ALVEOLI
52643

AMINES
52223, 52298, 52352, 52416, 52433, 52458, 52493, 52552

AMINO ACIDS
52594, 52621, 52638

AMMONIA
52049, 52053, 52148, 52149, 52178, 52204, 52216, 52221, 52223, 52226, 52227, 52298, 52331, 52416, 52430, 52433, 52458, 52487, 52493, 52517, 52563, 52571, 52579, 52593, 52700, 52772

AMMONIUM COMPOUNDS
52049, 52053, 52148, 52149, 52153, 52178, 52199, 52204, 52216, 52221, 52223, 52226, 52227, 52298, 52331, 52416, 52430, 52433, 52458, 52487, 52493, 52517, 52563, 52571, 52579, 52593, 52700, 52772

ANIMALS (NON-HUMAN)
52148, 52574, 52585, 52587, 52589, 52592, 52594, 52602, 52605, 52606, 52611, 52614, 52615, 52618, 52625, 52627, 52633, 52639, 52640, 52641, 52643, 52650, 52700

ANTIMONY COMPOUNDS
52402, 52403, 52447, 52555, 52569

AREA EMISSION ALLOCATIONS
52718, 52722

AREA SURVEYS
52056, 52076, 52091, 52100, 52102, 52107, 52398, 52411, 52413, 52414, 52415, 52418, 52420, 52421, 52422, 52424, 52425, 52426, 52428, 52431, 52433, 52434, 52436, 52437, 52439, 52440, 52441, 52442, 52445, 52446, 52447, 52448, 52452, 52453, 52454, 52458, 52467, 52469, 52470, 52471, 52472, 52474, 52475, 52476, 52477, 52481, 52483, 52488, 52490, 52496, 52500, 52510, 52511, 52513, 52514, 52519, 52520, 52523, 52525, 52530, 52535, 52537, 52580, 52582, 52583, 52584, 52586, 52590, 52597, 52598, 52599, 52601, 52602, 52608, 52609, 52610, 52613, 52619, 52623, 52624, 52626, 52630, 52632, 52647, 52648, 52653, 52655, 52656, 52662, 52668, 52669, 52670, 52674, 52675, 52676, 52677, 52678, 52679, 52680, 52681, 52683, 52684, 52686, 52691, 52695, 52697, 52702, 52703, 52709, 52720, 52728, 52742, 52744, 52749, 52751, 52768, 52787, 52792

AROMATIC HYDROCARBONS
52049, 52151, 52226, 52227, 52288, 52332,
52362, 52388, 52393, 52405, 52424, 52439,
52547, 52557, 52607, 52717, 52734, 52753

ARSENIC COMPOUNDS
52287, 52402, 52447, 52555, 52569, 52649

ASBESTOS
52644, 52650

ASBESTOSIS
52644

ASTHMA
52584, 52586, 52613, 52615, 52644

ATMOSPHERIC MOVEMENTS
52072, 52390, 52411, 52416, 52421, 52422,
52431, 52433, 52442, 52456, 52466, 52467,
52468, 52471, 52476, 52477, 52481, 52485,
52488, 52494, 52496, 52497, 52506, 52510,
52512, 52514, 52518, 52520, 52521, 52523,
52525, 52527, 52528, 52529, 52537, 52776,
52779

ATTACK RATES
52584, 52596, 52610, 52611, 52630, 52632,
52648

AUTOMATIC MEASUREMENT METHODS
52334, 52387, 52779, 52787

AUTOMOBILES
52055, 52056, 52058, 52068, 52072, 52077,
52083, 52097, 52129, 52155, 52164, 52166,
52192, 52200, 52245, 52249, 52252, 52255,
52259, 52282, 52303, 52306, 52308, 52356,
52408, 52468, 52473, 52526, 52634, 52748,
52759, 52769, 52779, 52780, 52781, 52790,
52793

AUTOMOTIVE EMISSION CONTROL
52050, 52065, 52066, 52080, 52095, 52104,
52111, 52112, 52114, 52120, 52124, 52129,
52137, 52143, 52155, 52166, 52167, 52171,
52175, 52176, 52177, 52182, 52184, 52189,
52190, 52193, 52196, 52200, 52210, 52213,
52214, 52217, 52239, 52245, 52249, 52252,
52253, 52255, 52259, 52276, 52281, 52282,
52285, 52294, 52301, 52308, 52311, 52315,
52562, 52759, 52780

AUTOPSY
52606, 52612, 52631

AZINES
52135, 52772

AZO DYE
52359

B

BACTERIA
52627

BAFFLES
52302

BAG FILTERS
52125, 52260

BALLOONS
52333, 52527

BANDING
52677

BARIUM COMPOUNDS
52402, 52447

BATTERY MANUFACTURING
52638

BELGIUM
52109, 52476, 52788

BENZENES
52049, 52388, 52393, 52424, 52547, 52557,
52717, 52734, 52753

BENZO(3-4)PYRENE
52323, 52592

BENZOPYRENES
52323, 52592

BERYLLIUM COMPOUNDS
52640

BIOCHEMISTRY
52593, 52594, 52621, 52633, 52638, 52649

BIOLOGICAL FACTORS
52593, 52594, 52621, 52633, 52638, 52649

BLAST FURNACE AND BASIC STEEL PRODUCTS M
52279

BLOOD CELLS
52605, 52616, 52620, 52621, 52643

BLOOD CHEMISTRY
52620, 52621, 52629, 52639, 52643

BLOOD VESSELS
52593, 52639

BODIES OF WATER
52057, 52422, 52430, 52438, 52518, 52520,
52550, 52653

BOILERS
52047, 52098, 52109, 52114, 52126, 52132,
52139, 52144, 52156, 52170, 52172, 52186,
52204, 52232, 52233, 52235, 52241, 52242,
52264, 52275, 52297, 52310, 52321, 52464,
52723, 52725, 52731

BONES
52639, 52641

BORON COMPOUNDS
52631

BROMINE
52402, 52447, 52535, 52555

BRONCHIAL CANCER
52612

BRONCHITIS
52586, 52613, 52644

BROWNIAN MOTION
52505

BUDGETING
52754

BUILDINGS
52074, 52097, 52269, 52299, 52363, 52435

BUTANES
52393

BUTENES
52393, 52538, 52578

BUTYRALDEHYDES
52439

BY-PRODUCT RECOVERY
52073, 52113, 52136, 52145, 52152, 52165,
52169, 52171, 52181, 52195, 52205, 52265,
52272, 52273, 52279, 52291, 52296, 52312,
52321, 52560, 52785

C

CABBAGE
52691, 52698

CADMIUM
52701

CADMIUM COMPOUNDS
52059, 52085, 52378, 52404, 52420, 52430,
52432, 52447, 52462, 52464, 52555, 52617,
52631, 52633, 52640, 52653, 52663, 52668,
52701, 52777

CALCIUM COMPOUNDS
52085, 52360, 52402, 52447, 52456, 52640

CALIBRATION METHODS
52327, 52341, 52364, 52387, 52388, 52401

CALIFORNIA
52102, 52535, 52583

CANADA
52325, 52400, 52609

CANCER
52587, 52599, 52603, 52606, 52612, 52644

CARBON
52203, 52207, 52216, 52228, 52273, 52552,
52553, 52573

CARBON BLACK
52573

CARBON DIOXIDE
52049, 52052, 52145, 52176, 52239, 52278,
52279, 52364, 52486, 52501, 52549, 52556,
52570, 52571, 52590, 52730

CARBON DISULFIDE
52328, 52607

CARBON MONOXIDE
52046, 52050, 52052, 52058, 52082, 52083,
52089, 52095, 52097, 52099, 52100, 52102,
52105, 52108, 52109, 52111, 52124, 52130,
52131, 52143, 52155, 52159, 52171, 52185,
52192, 52196, 52239, 52249, 52250, 52265,
52276, 52280, 52282, 52303, 52308, 52364,
52366, 52368, 52391, 52392, 52420, 52424,
52434, 52436, 52441, 52449, 52452, 52454,
52463, 52465, 52466, 52468, 52470, 52473,
52474, 52516, 52547, 52549, 52563, 52570,
52571, 52577, 52583, 52629, 52635, 52637,
52642, 52643, 52644, 52649, 52720, 52721,
52723, 52727, 52730, 52733, 52761, 52776,
52777, 52779, 52780

CARBON TETRACHLORIDE
52459, 52543

CARBONYLS
52384

CARBOXYHEMOGLOBIN
52609, 52629

CARBURETION
52120, 52124, 52155, 52252

CARCINOGENS
52323, 52356, 52606, 52629, 52650

CARDIOVASCULAR DISEASES
52629, 52630

CASCADE IMPACTORS
52369, 52406

CATALYSIS
52106, 52130, 52131, 52140, 52142, 52150,
52188, 52202, 52204, 52209, 52212, 52215,
52226, 52227, 52228, 52237, 52243, 52261,
52266, 52276, 52289, 52297, 52303, 52306,
52307, 52308, 52322, 52544, 52546, 52579,
52769

CATALYSTS
52106, 52130, 52140, 52150, 52188, 52204,
52209, 52212, 52226, 52228, 52237, 52261,
52276, 52289, 52297, 52303, 52307, 52308,
52544, 52579

CATALYTIC ACTIVITY
52106, 52215, 52227, 52243, 52303, 52306,
52308

CATALYTIC AFTERBURNERS
52106, 52116, 52130, 52131, 52151, 52159, 52205, 52276, 52296, 52303, 52306, 52307, 52308, 52316

CATALYTIC OXIDATION
52106, 52130, 52140, 52151, 52209, 52226, 52227, 52243, 52271, 52276, 52284, 52291, 52303, 52308, 52326, 52544, 52579

CELL GROWTH
52627, 52637, 52641, 52651

CELL METABOLISM
52592, 52627, 52651, 52683, 52685, 52692, 52708

CELLS (BIOLOGY)
52605, 52616, 52620, 52621, 52627, 52643, 52649, 52650, 52660

CEMENTS
52313, 52476

CENTRIFUGAL SEPARATORS
52158, 52313, 52317

CERAMICS
52086, 52711, 52712

CERIUM COMPOUNDS
52402, 52403, 52447, 52569

CESIUM COMPOUNDS
52402, 52447, 52569

CHARCOAL
52203, 52207, 52216, 52228, 52273, 52552, 52553

CHEMICAL COMPOSITION
52060, 52075, 52078, 52199, 52360, 52381, 52387, 52402, 52403, 52404, 52423, 52430, 52432, 52440, 52447, 52455, 52456, 52457, 52471, 52499, 52535, 52555, 52569

CHEMICAL METHODS
52322, 52326, 52327, 52331, 52335, 52339, 52357, 52359, 52364, 52379, 52392, 52394, 52395, 52397, 52406, 52636, 52787

CHEMICAL PROCESSES
52061, 52088, 52116, 52153, 52205, 52279, 52432, 52603, 52617, 52669, 52723, 52730

CHEMICALS AND ALLIED MANUFACTURING
52087, 52113, 52116, 52209, 52251, 52266, 52274, 52277, 52595, 52665, 52704

CHIBA PREFECTURE
52107, 52425, 52448, 52467, 52626, 52731

CHLORIDES
52315, 52331, 52430, 52432, 52455, 52499, 52517, 52747

CHLORINATED HYDROCARBONS
52085, 52371, 52389, 52424, 52451, 52459, 52543, 52603, 52607, 52753

CHLORINE
52364, 52392, 52403, 52447, 52535, 52555, 52777

CHLORINE COMPOUNDS
52315, 52331, 52364, 52402, 52430, 52432, 52455, 52499, 52517, 52747

CHLOROFORM
52424, 52459

CHLOROPLASTS
52661, 52692, 52706

CHLOROSIS
52677, 52680, 52686, 52688, 52689

CHROMATOGRAPHY
52068, 52322, 52323, 52325, 52326, 52328, 52329, 52332, 52336, 52340, 52344, 52347, 52352, 52356, 52362, 52364, 52371, 52381, 52384, 52389, 52393, 52394, 52399, 52408

CHROMIUM COMPOUNDS
52054, 52059, 52360, 52402, 52403, 52432, 52447, 52464, 52569, 52640, 52669, 52695

CHROMIUM OXIDES
52131

CIRCULATORY SYSTEM
52593, 52622, 52631, 52639

CITIZENS GROUPS
52081, 52744, 52782

CITRUS
52672

CITY GOVERNMENTS
52757, 52780, 52781

CLOUDS
52481, 52488, 52496, 52514, 52524, 52535

COAL
52057, 52079, 52084, 52092, 52093, 52101, 52115, 52117, 52122, 52163, 52187, 52220, 52241, 52262, 52272, 52286, 52302, 52304, 52418, 52763, 52797

COAL CONVERSION
52067, 52115, 52145, 52262, 52265

COAL PREPARATION
52187

COBALT COMPOUNDS
52059, 52402, 52403, 52404, 52430, 52432, 52447, 52569, 52640

COKE
52044, 52256, 52296, 52302, 52304, 52435

COLLECTORS (MECHANICAL)
52119, 52127, 52134, 52158, 52183, 52211, 52250, 52269, 52279, 52302, 52304, 52313, 52317, 52588, 52716

COLORIMETRY
52319, 52322, 52342, 52345, 52350, 52368, 52379, 52391, 52394, 52395, 52411, 52419, 52647

COLUMN CHROMATOGRAPHY
52323, 52332, 52344, 52381, 52399

COMBUSTION
52049, 52051, 52071, 52085, 52136, 52138, 52157, 52185, 52215, 52257, 52266, 52301, 52554, 52558, 52565, 52566, 52570, 52571, 52572, 52795

COMBUSTION AIR
52111, 52114, 52121, 52232, 52241, 52247, 52264, 52276, 52279, 52311, 52316, 52797

COMBUSTION PRODUCTS
52047, 52049, 52067, 52079, 52082, 52107, 52116, 52131, 52186, 52232, 52240, 52254, 52293, 52414, 52428, 52562, 52563, 52570, 52571, 52572, 52593, 52718, 52733, 52763, 52785, 52789

COMMERCIAL EQUIPMENT
52364, 52716

COMMERCIAL FIRMS
52069, 52072, 52104, 52200, 52236, 52364, 52748, 52781, 52782

COMPLAINTS
52076, 52715, 52739, 52760, 52770, 52771, 52772, 52789, 52793

COMPRESSION
52157

COMPUTER PROGRAMS
52259, 52375, 52398, 52511, 52523

COMPUTERS
52067, 52072, 52091, 52367, 52489, 52506, 52762, 52776

CONDENSATION
52127, 52135, 52266, 52559, 52588

CONDENSATION (ATMOSPHERIC)
52413, 52481, 52488, 52496, 52497, 52514, 52524, 52534, 52535

CONDUCTIMETRIC METHODS
52319, 52321, 52331, 52353, 52413

CONSTRUCTION MATERIALS
52146, 52313, 52386, 52476, 52711

CONTINUOUS MONITORING
52318, 52337, 52363, 52367, 52375, 52390, 52398, 52410, 52411, 52427, 52787

CONTROL AGENCIES
52751, 52774, 52780, 52781, 52786

CONTROL EQUIPMENT-GAS STREAMS
52045, 52071, 52084, 52106, 52113, 52116, 52119, 52122, 52125, 52127, 52130, 52131, 52134, 52136, 52142, 52144, 52149, 52151, 52152, 52154, 52158, 52159, 52167, 52173, 52174, 52175, 52178, 52183, 52191, 52197, 52198, 52199, 52201, 52203, 52205, 52211, 52218, 52222, 52250, 52251, 52252, 52256, 52258, 52260, 52265, 52268, 52269, 52270, 52276, 52278, 52279, 52282, 52284, 52295, 52296, 52297, 52299, 52302, 52303, 52304, 52305, 52306, 52307, 52308, 52313, 52314, 52316, 52317, 52383, 52404, 52406, 52429, 52474, 52539, 52588, 52716, 52730

CONTROL PROGRAMS
52142, 52200, 52247, 52283, 52299, 52473, 52484, 52715, 52736, 52737, 52739, 52741, 52743, 52749, 52754, 52757, 52761, 52763, 52773, 52774, 52778, 52780, 52784, 52796

CONVECTION (ATMOSPHERIC)
52520

COOLING
52266

COOLING TOWERS
52118, 52194

COPPER
52714

COPPER COMPOUNDS
52059, 52360, 52378, 52402, 52404, 52420, 52432, 52447, 52464, 52631, 52633, 52640, 52647, 52653, 52695

CORROSION
52278, 52711, 52713, 52714, 52744

COSMIC RAYS
52487

COSTS
52066, 52084, 52101, 52116, 52138, 52145, 52152, 52156, 52162, 52183, 52187, 52221, 52229, 52230, 52235, 52252, 52256, 52260, 52263, 52271, 52330, 52364, 52632, 52715, 52717, 52736, 52754, 52767, 52781, 52785

COTTON
52536

CRITERIA
52256, 52642, 52645, 52724, 52733, 52770, 52771, 52786

CROP SERVICES
52536

CROP SPRAYING
52536

CROPS
52536, 52642, 52651, 52653, 52659, 52661, 52665, 52666, 52667, 52673, 52676, 52677, 52678, 52680, 52690, 52706

CRYSTAL STRUCTURE
52559

CUPOLAS
52250, 52256

CYANIDES
52059, 52331, 52423, 52430, 52563, 52571, 52649

CYCLIC CRUDES AND INTERMEDIATE PRODUCTIO
52087, 52266, 52274, 52277

CZECHOSLOVAKIA
52093, 52096, 52250, 52279, 52300, 52310, 52399, 52401, 52402, 52403, 52435, 52454, 52472, 52523, 52530, 52575, 52607, 52711, 52714, 52735

D

DATA ANALYSIS
52072, 52259, 52375, 52398, 52787

DATA HANDLING SYSTEMS
52067, 52072, 52259, 52367, 52375, 52398, 52511, 52523, 52787

DECISIONS
52765

DECOMPOSITION
52049, 52085, 52263, 52266, 52571, 52577, 52711

DENSITY
52351, 52561

DEPOSITION
52499, 52517, 52526, 52653

DIAGNOSIS
52600, 52606, 52607, 52612, 52631

DIESEL ENGINES
52050, 52069, 52078, 52080, 52094, 52104, 52108, 52112, 52177, 52184, 52193, 52213, 52252, 52255, 52258, 52288, 52292, 52300

DIFFUSION (ATMOSPHERIC)
52088, 52474, 52480, 52481, 52484, 52485, 52486, 52488, 52489, 52490, 52496, 52500, 52505, 52506, 52507, 52509, 52515, 52522, 52523, 52532, 52533, 52545, 52732, 52763

DIFFUSION MODELS
52474, 52481, 52484, 52485, 52486, 52488, 52489, 52490, 52496, 52500, 52506, 52507, 52509, 52515, 52522, 52523, 52532, 52732, 52763

DIGESTIVE SYSTEM
52592, 52616, 52628, 52631

DIGITAL METHODS
52337, 52351, 52367

DIPHENYLS
52332

DISSOCIATION
52487

DOGS
52640

DOMESTIC HEATING
52043, 52079, 52156, 52390, 52411, 52414, 52788

DROPLETS
52535

DRY CLEANING PLANTS (EXCEPT RUG)
52753

DRY CLEANING SOLVENTS
52753

DRYING
52148

DUST FALL
52469, 52477, 52517

DUSTS
52054, 52105, 52113, 52119, 52125, 52128, 52134, 52147, 52154, 52158, 52173, 52183, 52194, 52197, 52199, 52208, 52211, 52218, 52220, 52222, 52224, 52233, 52250, 52251, 52256, 52260, 52269, 52279, 52280, 52304, 52312, 52313, 52317, 52327, 52337, 52387, 52404, 52409, 52410, 52420, 52428, 52431, 52432, 52434, 52435, 52449, 52455, 52456, 52457, 52460, 52461, 52463, 52464, 52469, 52471, 52474, 52482, 52498, 52526, 52539, 52541, 52569, 52575, 52588, 52597, 52601, 52638, 52647, 52691, 52695, 52706, 52716, 52757, 52797

DYE MANUFACTURING
52087, 52266, 52274, 52277

DYNAMOMETERS
52072, 52083, 52106, 52303

E

ECONOMICS
52066, 52084, 52101, 52116, 52138, 52145, 52152, 52156, 52162, 52183, 52187, 52221, 52229, 52230, 52235, 52252, 52256, 52260, 52263, 52271, 52330, 52364, 52632, 52715, 52717, 52736, 52754, 52767, 52781, 52785

EDUCATION
52789

EFFICIENCY
52045, 52061, 52065, 52070, 52073, 52084, 52109, 52115, 52117, 52119, 52122, 52129, 52134, 52139, 52141, 52144, 52145, 52146, 52148, 52152, 52153, 52156, 52157, 52158, 52159, 52183, 52187, 52188, 52192, 52194, 52195, 52197, 52202, 52204, 52206, 52207, 52212, 52213, 52218, 52220, 52224, 52226, 52230, 52233, 52235, 52237, 52249, 52254, 52257, 52258, 52261, 52265, 52267, 52273, 52279, 52282, 52284, 52289, 52290, 52291, 52293, 52295, 52304, 52308, 52310, 52314, 52324, 52335, 52408, 52544, 52546, 52579

ELECTRIC BATTERIES
52246

ELECTRIC FURNACES
52601

ELECTRIC POWER GENERATION
52057, 52067, 52073, 52084, 52101, 52102, 52105, 52108, 52122, 52145, 52246, 52262, 52283, 52291, 52411, 52421, 52645, 52670, 52691, 52704, 52713, 52763, 52797

ELECTRIC POWER SOURCES
52071, 52164, 52246

ELECTRIC, GAS, AND SANITARY SERVICES
52043, 52057, 52059, 52061, 52067, 52071, 52073, 52084, 52085, 52098, 52101, 52102, 52105, 52108, 52113, 52116, 52122, 52128, 52145, 52147, 52148, 52149, 52178, 52180, 52197, 52198, 52216, 52246, 52262, 52283, 52291, 52313, 52411, 52418, 52421, 52429, 52458, 52464, 52645, 52670, 52691, 52696, 52704, 52713, 52763, 52781, 52797

ELECTRICAL AND ELECTRONIC EQUIPMENT PLAN
52638

ELECTRICAL PROPERTIES
52078, 52201, 52246, 52314, 52409, 52413, 52559

ELECTRICAL RESISTANCE
52409

ELECTRICITY (ATMOSPHERIC)
52545

ELECTROCHEMICAL METHODS
52327, 52335, 52357, 52364, 52392, 52397, 52636, 52787

ELECTROLYSIS
52397

ELECTRON MICROSCOPY
52078, 52472, 52710

ELECTROSTATIC PRECIPITATORS
52122, 52201, 52222, 52256, 52297, 52313, 52539

EMISSION INVENTORIES
52102, 52107, 52758

EMISSION STANDARDS
52063, 52079, 52123, 52200, 52250, 52465, 52507, 52718, 52719, 52720, 52721, 52722, 52723, 52725, 52726, 52728, 52731, 52732, 52733, 52734, 52735, 52747, 52748, 52750, 52752, 52753, 52756, 52761, 52762, 52767, 52769, 52780, 52788

EMISSIVITY
52386

EMPHYSEMA
52644

ENFORCEMENT PROCEDURES
52716, 52721, 52732, 52741, 52748, 52751, 52755, 52756, 52764, 52773, 52778, 52781

ENGINE DESIGN MODIFICATION
52065, 52104, 52114, 52196, 52210, 52239, 52245, 52249, 52255, 52259, 52276, 52281, 52315

ENGINE EMISSIONS
52046, 52050, 52052, 52056, 52065, 52068, 52069, 52075, 52077, 52078, 52080, 52083, 52089, 52090, 52091, 52094, 52097, 52098, 52099, 52102, 52103, 52106, 52108, 52112, 52114, 52120, 52123, 52124, 52129, 52130, 52137, 52143, 52155, 52157, 52164, 52166, 52167, 52175, 52176, 52182, 52184, 52192, 52193, 52196, 52200, 52210, 52213, 52214, 52226, 52245, 52249, 52252, 52255, 52276, 52282, 52288, 52293, 52300, 52301, 52303, 52306, 52307, 52308, 52315, 52356, 52364, 52368, 52408, 52425, 52436, 52441, 52454, 52468, 52470, 52473, 52475, 52496, 52503, 52515, 52554, 52556, 52629, 52634, 52635, 52643, 52668, 52682, 52704, 52717, 52720, 52721, 52748, 52769, 52777, 52779, 52780, 52790, 52793

ENGINE OPERATING CYCLES
52050, 52052, 52065, 52069, 52072, 52078, 52080, 52083, 52089, 52111, 52112, 52120, 52124, 52157, 52164, 52166, 52176, 52193, 52196, 52213, 52249, 52252, 52253, 52292, 52294, 52301

ENGINE OPERATION MODIFICATION
52050, 52066, 52080, 52095, 52104, 52111, 52120, 52124, 52137, 52155, 52166, 52171, 52176, 52177, 52182, 52184, 52189, 52190, 52193, 52196, 52210, 52213, 52214, 52217, 52245, 52252, 52255, 52276, 52285, 52294, 52301, 52311, 52562

ENGINES
52050, 52065, 52066, 52069, 52078, 52080, 52089, 52094, 52104, 52108, 52112, 52114, 52130, 52131, 52137, 52143, 52155, 52157, 52164, 52175, 52176, 52177, 52184, 52189, 52193, 52210, 52213, 52214, 52239, 52249, 52252, 52253, 52255, 52258, 52276, 52281, 52285, 52288, 52292, 52294, 52300, 52315, 52721

ENZYMES
52592, 52605, 52616, 52620, 52621, 52633, 52635, 52638, 52649, 52654, 52700

EPIDEMIOLOGY
52437, 52580, 52582, 52584, 52585, 52586, 52587, 52590, 52596, 52597, 52599, 52601, 52602, 52608, 52610, 52611, 52613, 52615, 52619, 52626, 52630, 52648

EQUIPMENT CRITERIA
52256, 52770

EQUIPMENT STANDARDS
52259, 52364, 52730, 52751

ESTERS
52049, 52339, 52340

ETHERS
52649

ETHYLENE
52393, 52424, 52662, 52682

EUROPE
52043, 52044, 52046, 52056, 52057, 52062, 52064, 52071, 52073, 52074, 52075, 52079, 52080, 52086, 52092, 52093, 52096, 52103, 52105, 52109, 52114, 52115, 52116, 52117, 52118, 52122, 52145, 52147, 52154, 52155, 52164, 52173, 52196, 52197, 52198, 52199, 52205, 52220, 52240, 52249, 52250, 52253, 52255, 52256, 52262, 52265, 52268, 52270, 52271, 52276, 52279, 52282, 52288, 52300, 52301, 52310, 52313, 52316, 52317, 52320, 52321, 52322, 52326, 52341, 52342, 52354, 52379, 52390, 52391, 52392, 52399, 52401, 52402, 52403, 52408, 52412, 52415, 52434, 52435, 52454, 52472, 52476, 52478, 52479, 52491, 52492, 52504, 52511, 52512, 52513, 52522, 52523, 52524, 52530, 52534, 52536, 52539, 52541, 52548, 52558, 52559, 52564, 52569, 52574, 52575, 52579, 52585, 52591, 52593, 52594, 52604, 52607, 52614, 52616, 52620, 52621, 52622, 52628, 52630, 52638, 52644, 52646, 52647, 52649, 52650, 52657, 52663, 52665, 52706, 52708, 52709, 52710, 52711, 52712, 52714, 52717, 52718, 52724, 52730, 52733, 52734, 52735, 52736, 52740, 52753, 52764, 52784, 52787, 52788, 52796, 52797

EVAPORATORS
52149, 52178

EXCESS AIR
52111, 52114, 52241, 52247, 52264, 52316, 52797

EXCRETIONS
52251, 52594, 52621, 52636, 52638, 52641, 52700

EXHAUST SYSTEMS
52134, 52260, 52278, 52279, 52304, 52316

EXPERIMENTAL EQUIPMENT
52045, 52377, 52540

EXPERIMENTAL METHODS
52067, 52147, 52314, 52400, 52474, 52649, 52659

EXPLOSIONS
52225, 52505

EXPOSURE CHAMBERS
52574

EXPOSURE METHODS
52589, 52592, 52605, 52611, 52614, 52615, 52618, 52628, 52643, 52650, 52651, 52654, 52655, 52660, 52666, 52667, 52671, 52685, 52687, 52688, 52690, 52691, 52693, 52694, 52698, 52699, 52705, 52707

EXTERNAL COMBUSTION ENGINES
52281

EYE IRRITATION
52413, 52627, 52634, 52635

F

FABRIC FILTERS
52125, 52260

FANS (BLOWERS)
52260, 52278

FARMS
52053, 52076, 52148, 52451, 52462, 52536, 52640, 52655, 52678

FEASIBILITY STUDIES
52095, 52252

FEEDLOTS
52076, 52458, 52772

FIELD TESTS
52096, 52234, 52257, 52308, 52712

FILTER FABRICS
52197, 52256, 52314, 52404, 52406

FILTERS
52125, 52154, 52173, 52197, 52199, 52203, 52218, 52250, 52251, 52256, 52260, 52268, 52282, 52313, 52314, 52404, 52406

FINLAND
52504

FIRING METHODS
52062, 52080, 52111, 52114, 52121, 52154, 52162, 52168, 52171, 52172, 52186, 52219, 52228, 52229, 52232, 52235, 52238, 52241, 52247, 52254, 52257, 52264, 52275, 52276, 52279, 52292, 52302, 52304, 52311, 52316, 52540, 52797

FLAME AFTERBURNERS
52136, 52174, 52205, 52250, 52258, 52276, 52296, 52302

FLAME IONIZATION DETECTOR (CO)
52326, 52347, 52384, 52393, 52394, 52408

FLARES
52191, 52270

FLOWERS
52651, 52652, 52656, 52658, 52661, 52672, 52676, 52678, 52688, 52694, 52699, 52703

FLOWMETERS
52349

FLUID FLOW
52146, 52214, 52220, 52260, 52349, 52480, 52483, 52540, 52549, 52558

FLUORESCENCE
52323, 52344, 52360, 52365, 52370, 52374, 52380

FLUORIDES
52045, 52086, 52331, 52379, 52636, 52641, 52642, 52655, 52672, 52689, 52704

FLUORINE
52639, 52641, 52706

FLUORINE COMPOUNDS
52045, 52086, 52331, 52379, 52636, 52641, 52642, 52655, 52672, 52689, 52704, 52709

FLY ASH
52085, 52122, 52147, 52265, 52402, 52435, 52456

FOG
52413, 52497, 52535

FOOD AND KINDRED PRODUCTS INDUSTRY
52053, 52385, 52416, 52433

FORESTS
52520, 52670, 52683, 52684, 52689, 52709

FORMALDEHYDES
52100, 52345, 52384, 52407, 52439, 52493

FRANCE
52196, 52249, 52255, 52270, 52282, 52313, 52316, 52390, 52412, 52415, 52558, 52709, 52718, 52733, 52734, 52784, 52797

FREE RADICALS
52487, 52500, 52542, 52547, 52548, 52549

FRUITS
52651, 52655, 52663, 52672, 52695

FUEL ADDITIVES
52103, 52106, 52108, 52282, 52288, 52300, 52303, 52717, 52733

FUEL CHARGING
52080, 52302, 52304, 52540

FUEL EVAPORATION
52098, 52167

FUEL GASES
52052, 52074, 52084, 52092, 52095, 52101, 52160, 52163, 52168, 52186, 52229, 52233, 52241, 52242, 52262, 52272, 52283, 52286, 52294, 52309, 52556, 52563, 52566, 52572

FUEL OIL PREPARATION
52061, 52110, 52202, 52244, 52286, 52289, 52716

FUEL OILS
52057, 52084, 52160, 52168, 52172, 52186, 52229, 52265, 52272, 52275, 52286, 52297, 52310, 52645, 52733, 52734, 52763, 52788

FUEL STANDARDS
52733, 52734

FUEL TANK EVAPORATION
52167

FUEL TREATMENT
52061, 52067, 52084, 52110, 52115, 52117, 52145, 52162, 52187, 52202, 52203, 52225, 52244, 52262, 52265, 52286, 52289, 52297, 52546, 52716, 52736, 52797

FUMES
52045, 52085, 52109, 52280, 52647

FURNACES
52051, 52054, 52070, 52074, 52086, 52093, 52095, 52098, 52114, 52126, 52138, 52154, 52168, 52171, 52172, 52217, 52233, 52235, 52241, 52250, 52254, 52256, 52296, 52297, 52302, 52304, 52312, 52316, 52326, 52601, 52723, 52725, 52731

G

GAS CHROMATOGRAPHY
52068, 52322, 52323, 52326, 52328, 52329, 52332, 52336, 52340, 52347, 52352, 52356, 52362, 52364, 52371, 52384, 52389, 52393, 52394, 52408

GAS SAMPLING
52047, 52068, 52324, 52333, 52336, 52338, 52340, 52353, 52362, 52556

GAS TURBINE ENGINES
52089, 52108, 52114, 52210

GASIFICATION
52067, 52115, 52145, 52262, 52265

GASOLINES
52103, 52293, 52294, 52356, 52717, 52733, 52734

GENETICS
52609, 52637, 52658, 52659, 52673

GERMANY, FEDERAL REPUBLIC
52043, 52044, 52046, 52056, 52062, 52064, 52071, 52073, 52074, 52075, 52079, 52080, 52086, 52115, 52116, 52117, 52118, 52122, 52145, 52147, 52154, 52155, 52164, 52173, 52197, 52198, 52199, 52205, 52253, 52262, 52276, 52320, 52322, 52326, 52342, 52354, 52392, 52408, 52434, 52478, 52479, 52491, 52511, 52512, 52539, 52548, 52574, 52591, 52594, 52604, 52614, 52622, 52638, 52644, 52646, 52650, 52657, 52663, 52665, 52710, 52712, 52724, 52730, 52736, 52740, 52753, 52764, 52784, 52796

GLADIOLUS
52672

GLASS
52711

GLASS FABRICS
52404, 52406

GOATS
52639

GRAVITY COLLECTORS
52302

GRAVITY SETTLING (CONTROL)
52313

GREAT BRITAIN
52569, 52784

GROUND LEVEL
52240, 52510, 52512, 52520

GUINEA PIGS
52615, 52627, 52650

H

HALOGEN GASES
52332, 52364, 52392, 52402, 52403, 52447, 52535, 52555, 52639, 52641, 52706, 52777

HALOGENATED HYDROCARBONS
52085, 52371, 52389, 52424, 52451, 52459, 52502, 52543, 52603, 52607, 52649, 52753

HAZE
52534

HEALTH IMPAIRMENT
52048, 52101, 52418, 52429, 52437, 52448, 52452, 52453, 52583, 52585, 52587, 52588, 52602, 52607, 52608, 52623, 52624, 52626, 52641, 52642, 52643, 52644, 52645, 52646, 52647, 52729, 52731, 52753, 52759, 52765, 52766, 52775, 52790, 52793, 52795

HEALTH STATISTICS
52437, 52448, 52452, 52453, 52580, 52582, 52583, 52584, 52586, 52590, 52595, 52596, 52597, 52598, 52599, 52601, 52602, 52603, 52608, 52609, 52613, 52623, 52624, 52626, 52630, 52632, 52648

HEARINGS
52721, 52748, 52769

HEART
52631

HEAT TRANSFER
52067, 52199, 52266, 52482, 52486

HEAVY-DUTY VEHICLES
52069, 52083, 52164

HEIGHT FINDING
52316, 52484

HEMATOLOGY
52586, 52605, 52609, 52620, 52621, 52629, 52638, 52639, 52643, 52649, 52795

HEMOGLOBIN
52649

HERBS
52677

HI-VOL SAMPLERS
52369

HIGHWAYS
52060, 52081, 52090, 52299, 52420, 52443, 52454, 52520, 52662, 52668, 52678, 52792

HOGS
52148, 52700

HORMONES
52614

HUMIDITY
52334, 52369, 52468, 52492, 52497, 52504, 52508, 52513, 52521, 52531, 52535, 52562, 52635, 52714, 52776

HYDROCHLORIC ACID
52059, 52128, 52147, 52161, 52197, 52278, 52331, 52392, 52571

HYDRODESULFURIZATION
52110, 52202, 52289

HYDROFLUORIC ACID
52147, 52197, 52364, 52366, 52655, 52689

HYDROGEN
52057, 52123, 52253, 52262, 52265, 52272, 52294, 52333, 52388, 52486, 52563, 52565, 52572

HYDROGEN SULFIDE
52053, 52082, 52121, 52161, 52178, 52180, 52223, 52231, 52248, 52265, 52296, 52321, 52328, 52329, 52331, 52366, 52392, 52416, 52418, 52433, 52449, 52458, 52649, 52772

HYDROGENATION
52202

HYDROLYSIS
52546

HYDROXIDES
52547, 52711

HYPERSENSITIVITY
52596, 52615

HYPOXIA
52622

I

IMMUNOLOGY
52596, 52618, 52644

INCINERATORS (REFUSE)
52059, 52085, 52098, 52128, 52147, 52197, 52429, 52458, 52464

INCINERATORS (WASTE GASES)
52106, 52116, 52130, 52131, 52136, 52142, 52151, 52159, 52174, 52175, 52205, 52250, 52252, 52258, 52276, 52296, 52302, 52303, 52306, 52307, 52308, 52316, 52429

INDOOR
52060, 52097, 52363, 52435

INDUSTRIAL AREAS
52055, 52063, 52105, 52240, 52411, 52419, 52437, 52439, 52460, 52462, 52464, 52471, 52481, 52490, 52498, 52511, 52520, 52527, 52556, 52597, 52599, 52630, 52640, 52655, 52663, 52669, 52670, 52678, 52681, 52684, 52691, 52712, 52722, 52744, 52745

INERTIAL SEPARATION
52313

INFECTIOUS DISEASES
52589, 52611, 52618, 52619, 52627

INFRARED RADIATION
52386, 52528, 52534

INFRARED SPECTROMETRY
52322, 52331, 52348, 52394, 52397, 52408, 52568

INHIBITION
52633, 52671, 52694, 52700

INORGANIC ACIDS
52059, 52128, 52147, 52161, 52197, 52278, 52331, 52364, 52366, 52392, 52406, 52493, 52500, 52548, 52571, 52625, 52655, 52683, 52689, 52711, 52731

INSPECTION
52473, 52784

INSTRUMENTATION
52301, 52321, 52333, 52364, 52375, 52382, 52401

INTERNAL COMBUSTION ENGINES
52050, 52065, 52066, 52069, 52078, 52080, 52094, 52104, 52108, 52112, 52114, 52130, 52131, 52137, 52143, 52155, 52157, 52164, 52175, 52176, 52177, 52184, 52189, 52193, 52213, 52214, 52239, 52249, 52252, 52253, 52255, 52258, 52276, 52285, 52288, 52292, 52294, 52300, 52315, 52721

INVERSION
52494, 52498, 52506, 52512, 52514, 52519, 52520, 52530, 52532

IODIMETRIC METHODS
52394

IODINE
52535

IODINE COMPOUNDS
52357

IONIZATION
52073, 52487, 52658

IONIZATION CHAMBERS
52475

IONS
52199, 52230, 52298, 52322, 52333, 52413, 52427, 52432, 52445, 52456, 52457, 52461, 52476, 52499, 52539, 52545, 52692

IRON
52552, 52714

IRON COMPOUNDS
52054, 52059, 52085, 52360, 52378, 52387, 52402, 52403, 52420, 52430, 52432, 52447, 52560, 52569, 52640, 52647, 52695

IRON OXIDES
52154, 52256, 52404, 52440, 52647

ISOPENTANES
52424

ISOTOPES
52057, 52556, 52701

ITALY
52105, 52301

J

JAPAN
52047, 52048, 52049, 52050, 52051, 52052, 52053, 52054, 52055, 52058, 52059, 52060, 52061, 52063, 52065, 52066, 52068, 52069, 52070, 52072, 52076, 52077, 52081, 52082, 52083, 52085, 52087, 52088, 52089, 52090, 52094, 52097, 52098, 52099, 52100, 52107, 52110, 52111, 52112, 52119, 52120, 52121, 52123, 52124, 52125, 52126, 52127, 52128, 52129, 52130, 52131, 52132, 52133, 52134, 52135, 52136, 52137, 52138, 52139, 52140, 52141, 52142, 52143, 52144, 52146, 52148, 52149, 52150, 52151, 52152, 52153, 52156, 52157, 52158, 52159, 52160, 52161, 52162, 52163, 52165, 52166, 52167, 52168, 52169, 52170, 52171, 52172, 52174, 52175, 52176, 52177, 52178, 52179, 52180, 52181, 52182, 52183, 52184, 52185, 52186, 52188, 52189, 52190, 52191, 52192, 52193, 52194, 52195, 52200, 52201, 52202, 52203, 52204, 52206, 52207, 52208, 52209, 52210, 52211, 52212, 52213, 52214, 52215, 52216, 52217, 52218, 52219, 52221, 52222, 52223, 52224, 52225, 52226, 52227, 52228, 52229, 52230, 52231, 52232, 52233, 52234, 52235, 52236, 52237, 52238, 52239, 52241, 52242, 52243, 52244, 52245, 52247, 52251, 52254, 52257, 52258, 52260, 52261, 52263, 52264, 52266, 52267, 52269, 52272, 52273, 52274, 52275, 52277, 52278, 52280, 52283, 52284, 52285, 52286, 52289, 52290, 52291, 52292, 52293, 52295, 52296, 52297, 52298, 52299, 52304, 52305, 52306, 52309, 52311, 52315, 52318, 52319, 52324, 52327, 52328, 52329, 52331, 52332, 52333, 52334, 52335, 52336, 52337, 52338, 52339, 52340, 52343, 52344, 52345, 52346, 52347, 52348, 52349, 52350, 52351, 52352, 52353, 52355, 52356, 52357, 52358, 52359, 52360, 52361, 52362, 52363, 52364, 52365, 52366, 52367, 52368, 52369, 52370, 52371, 52372, 52373, 52374, 52375, 52376, 52377, 52378, 52380, 52381, 52383, 52384, 52385, 52386, 52387, 52388, 52389, 52393 52394, 52395, 52396, 52397, 52398, 52404, 52405, 52406, 52407, 52409, 52410, 52413, 52416, 52417, 52418, 52419, 52420, 52421, 52422, 52423, 52424, 52425, 52427, 52428, 52429, 52430, 52431, 52432, 52433, 52436, 52437, 52438, 52439, 52440, 52441, 52442, 52443, 52444, 52445, 52446, 52447, 52448, 52449, 52450, 52451, 52452, 52453, 52455, 52456, 52457, 52458, 52459, 52460, 52461, 52462, 52463, 52464, 52465, 52466, 52467, 52468, 52469, 52470, 52471, 52473, 52474, 52475, 52477, 52480, 52481, 52483, 52484, 52485, 52486, 52487, 52488, 52489, 52490, 52493, 52494, 52495, 52496, 52497, 52498, 52499, 52500, 52501, 52502, 52503, 52506, 52507, 52508, 52509, 52510, 52514, 52515, 52516, 52517, 52518, 52519, 52520, 52521, 52525, 52526, 52527, 52532, 52533, 52537, 52538, 52540, 52542, 52543, 52545, 52546, 52547, 52549, 52550, 52551, 52552, 52553, 52554, 52555, 52556, 52557, 52560, 52562, 52563, 52565, 52566, 52567, 52568, 52570, 52571, 52572, 52576, 52577, 52578, 52580, 52581, 52582, 52583, 52584, 52586, 52588, 52589, 52590, 52592, 52596, 52597, 52598, 52599, 52600, 52601, 52602, 52603, 52605, 52606, 52608, 52610, 52611, 52612, 52613, 52615, 52617, 52619, 52623, 52624, 52625, 52626, 52627, 52631, 52633, 52634, 52635, 52636, 52637, 52639, 52640, 52641, 52642, 52643, 52648, 52651, 52652, 52653, 52654, 52656, 52657, 52658, 52659, 52660, 52661, 52662, 52664, 52666, 52667, 52668, 52670, 52671, 52672, 52673, 52674, 52675, 52676, 52677, 52678, 52679, 52680, 52681, 52682, 52684, 52685, 52686, 52687, 52688, 52690, 52691, 52692, 52693, 52694, 52695, 52697, 52698, 52699, 52700, 52702, 52703, 52705, 52707, 52713, 52715, 52716, 52719, 52720, 52721, 52722, 52723, 52724, 52725, 52726, 52727, 52728, 52729, 52731, 52732, 52737, 52738, 52739, 52741, 52743, 52744, 52745, 52746, 52747, 52748, 52749, 52750, 52751, 52752, 52754, 52756, 52757, 52758, 52759, 52760, 52761, 52762, 52765, 52766, 52767, 52768, 52770, 52771, 52772, 52773, 52774, 52775, 52776, 52777, 52778, 52779, 52780, 52781, 52782, 52783, 52784, 52785, 52786, 52789, 52790, 52791, 52792, 52793, 52794, 52795, 52796, 52797

JET AIRCRAFT
52210, 52486, 52491, 52503

K

KANAGAWA PREFECTURE
52060, 52098, 52107, 52369, 52425, 52448, 52462, 52465, 52467, 52488, 52496, 52521, 52580, 52679, 52703, 52746, 52774, 52775, 52776, 52777, 52778

KEROSENE
52133, 52233, 52241

KETONES
52226, 52227, 52362, 52384, 52424, 52543, 52577

KIDNEYS
52631

KILNS
52121

KRAFT (SULFATE) PULPING
52053, 52121, 52231, 52321, 52385, 52458

L

LABORATORY ANIMALS
52585, 52587, 52589, 52602, 52618, 52641

LAND USE PLANNING
52754, 52755

LASERS
52318, 52354, 52370, 52373, 52396, 52482

LEAD COMPOUNDS
52054, 52059, 52060, 52085, 52097, 52106, 52282, 52360, 52378, 52387, 52404, 52420, 52430, 52432, 52434, 52447, 52454, 52464, 52466, 52555, 52569, 52601, 52617, 52620, 52621, 52627, 52633, 52638, 52640, 52647, 52649, 52653, 52663, 52668, 52733, 52734, 52777

LEAVES
52526, 52652, 52655, 52658, 52660, 52666, 52667, 52669, 52670, 52671, 52674, 52676, 52677, 52680, 52681, 52685, 52686, 52687, 52688, 52690, 52691, 52692, 52693, 52694, 52695, 52699, 52703, 52705, 52709

LEGISLATION
52105, 52733, 52735, 52736, 52737, 52750, 52751, 52752, 52756, 52758, 52772, 52777, 52786

LEUKOCYTES
52643

LIDAR
52346, 52400, 52492, 52504

LIGHT SCATTERING
52346, 52396, 52400, 52479, 52504, 52508, 52524, 52551

LIGHT-DUTY VEHICLES
52055, 52056, 52058, 52068, 52072, 52077, 52083, 52097, 52129, 52155, 52164, 52166, 52192, 52200, 52245, 52249, 52252, 52255, 52259, 52282, 52303, 52306, 52308, 52356, 52408, 52468, 52473, 52526, 52634, 52748, 52759, 52769, 52779, 52780, 52781, 52790, 52793

LIMESTONE
52256

LIPIDS
52593

LITIGATION
52760, 52765

LIVER
52592, 52616, 52631

LOCAL GOVERNMENTS
52752

LOS ANGELES
52583

LOWER ATMOSPHERE
52400, 52426, 52472, 52479, 52495, 52503, 52508, 52512

LUBRICANTS
52052, 52096, 52106

LUNG CANCER
52587, 52599, 52606

LUNGS
52631, 52643

LYMPHOCYTES
52616, 52643

M

MAGNESIUM COMPOUNDS
52085, 52402, 52432, 52447, 52640

MAGNETIC SEPARATION
52187

MAGNETOHYDRODYNAMICS (MHD)
52073, 52101

MAINTENANCE
52260, 52279, 52302, 52429

MANGANESE COMPOUNDS
52059, 52085, 52360, 52387, 52402, 52430, 52432, 52447, 52464, 52535, 52569, 52581, 52695

MANUFACTURING INDUSTRIES
52053, 52087, 52096, 52113, 52114, 52116, 52121, 52209, 52224, 52225, 52231, 52251, 52266, 52270, 52274, 52277, 52279, 52280, 52321, 52385, 52416, 52433, 52458, 52493, 52595, 52638, 52662, 52665, 52695, 52704, 52733, 52772, 52781

MASS SPECTROMETRY
52325, 52332, 52333, 52336, 52356, 52362, 52372, 52389, 52394

MATHEMATICAL ANALYSES
52046, 52050, 52051, 52088, 52090, 52091, 52092, 52240, 52255, 52259, 52260, 52268, 52373, 52445, 52472, 52478, 52483, 52484, 52489, 52491, 52505, 52506, 52513, 52515, 52516, 52524, 52531, 52534, 52539, 52541, 52543, 52551, 52558, 52561, 52562, 52564, 52671, 52714, 52715, 52732, 52792

MATHEMATICAL MODELING
52051, 52091, 52255, 52268, 52478, 52484, 52515, 52524, 52531, 52543, 52558, 52714, 52715

MAXIMUM ALLOWABLE CONCENTRATION
52240, 52595, 52745, 52747, 52770, 52797

MBTH METHOD (ALDEHYDES)
52345, 52394

MEDICAL PERSONNEL
52617

MEMBRANE FILTRATION
52338, 52380, 52387, 52404, 52406

MEMBRANES
52649, 52708

MERCAPTANS
52053, 52121, 52180, 52226, 52231, 52234, 52290, 52328, 52329, 52416, 52433, 52458, 52493, 52772

MERCURY COMPOUNDS
52085, 52088, 52230, 52320, 52402, 52430, 52447, 52555, 52607, 52633, 52649, 52781

METABOLISM
52593, 52628, 52643, 52649, 52652, 52696

METAL COMPOUNDS
52054, 52059, 52060, 52085, 52088, 52097, 52106, 52199, 52230, 52282, 52320, 52332, 52360, 52364, 52365, 52378, 52387, 52402, 52403, 52404, 52420, 52430, 52432, 52434, 52440, 52447, 52454, 52455, 52456, 52462, 52464, 52466, 52471, 52535, 52555, 52560, 52569, 52581, 52588, 52601, 52607, 52617, 52620, 52621, 52627, 52631, 52633, 52638, 52640, 52647, 52649, 52653, 52663, 52668, 52669, 52695, 52696, 52701, 52733, 52734, 52777, 52781

METAL FABRICATION
52096, 52280, 52695

METAL INDUSTRIES
52279

METAL POISONING
52627

METALS
52064, 52320, 52386, 52552, 52701, 52711, 52714

METEOROLOGICAL INSTRUMENTS
52333, 52527

METEOROLOGY
52072, 52099, 52105, 52334, 52369, 52376, 52390, 52411, 52413, 52416, 52421, 52422, 52423, 52425, 52426, 52431, 52433, 52442, 52446, 52456, 52457, 52466, 52467, 52468, 52471, 52476, 52477, 52481, 52485, 52488, 52492, 52494, 52495, 52496, 52497, 52499, 52500, 52501, 52504, 52505, 52506, 52508, 52509, 52510, 52512, 52513, 52514, 52517, 52518, 52519, 52520, 52521, 52522, 52523, 52524, 52525, 52527, 52528, 52529, 52530, 52531, 52534, 52535, 52537, 52562, 52632, 52635, 52646, 52653, 52661, 52683, 52714, 52744, 52746, 52762, 52763, 52776, 52779

METHANES
52092, 52145, 52294, 52394, 52486, 52493, 52563, 52570, 52572, 52577

METROPOLITAN AREAS
52056, 52060, 52076, 52081, 52099, 52368, 52381, 52400, 52413, 52414, 52417, 52418, 52420, 52423, 52424, 52426, 52427, 52428, 52431, 52432, 52434, 52436, 52440, 52441, 52442, 52443, 52444, 52446, 52449, 52450, 52451, 52452, 52453, 52457, 52459, 52463, 52465, 52466, 52468, 52469, 52470, 52473, 52474, 52475, 52477, 52485, 52488, 52494, 52496, 52506, 52514, 52517, 52518, 52519, 52521, 52523, 52526, 52528, 52530, 52537, 52550, 52580, 52581, 52582, 52583, 52586, 52601, 52608, 52609, 52610, 52612, 52613, 52619, 52623, 52626, 52632, 52645, 52647, 52648, 52653, 52656, 52662, 52664, 52679, 52680, 52686, 52702, 52703, 52720, 52726, 52731, 52743, 52760, 52766, 52768, 52770, 52771, 52772, 52779, 52781, 52789

MICE
52592, 52605, 52606, 52633, 52643

MICROORGANISMS
52199, 52589, 52618, 52619, 52627, 52682, 52683

MICROSCOPY
52575

MIDDLE ATMOSPHERE
52333, 52486, 52487, 52491, 52502, 52503

MINERAL PROCESSING
52044, 52086, 52313, 52317, 52432, 52435

MINING
52067, 52092, 52153, 52220, 52270

MISSILE AND SPACECRAFT LAUNCH VEHICLES
52373

MISTS
52129, 52174, 52302, 52406, 52493, 52540, 52625

MOBILE EMISSION SOURCES
52055, 52056, 52058, 52068, 52069, 52072, 52077, 52083, 52090, 52091, 52097, 52098, 52099, 52102, 52107, 52120, 52124, 52129, 52155, 52164, 52166, 52182, 52192, 52196, 52200, 52210, 52245, 52246, 52249, 52252, 52255, 52259, 52282, 52301, 52303, 52306, 52308, 52356, 52368, 52373, 52408, 52419, 52425, 52434, 52436, 52441, 52443, 52454, 52466, 52468, 52473, 52475, 52486, 52491, 52503, 52526, 52556, 52634, 52668, 52704, 52720, 52733, 52748, 52759, 52768, 52769, 52779, 52780, 52781, 52786, 52788, 52790, 52792, 52793

MONITORING
52045, 52047, 52059, 52105, 52318, 52337, 52346, 52351, 52354, 52358, 52363, 52366, 52367, 52368, 52373, 52375, 52376, 52390, 52395, 52398, 52400, 52410, 52411, 52426, 52427, 52443, 52446, 52475, 52524, 52718, 52738, 52741, 52746, 52759, 52761, 52762, 52763, 52776, 52779, 52785, 52787

MONTHLY
52421, 52441, 52448, 52469, 52470, 52473, 52477, 52530, 52599

MORBIDITY
52437, 52448, 52452, 52580, 52582, 52583, 52596, 52597, 52599, 52602, 52608, 52610, 52613, 52623, 52624, 52626, 52630, 52632, 52648

MORTALITY
52599

MOUNTAINS
52491, 52550

N

NATIONAL GOVERNMENTS
52732, 52736, 52748, 52752, 52764, 52773

NATURAL GAS
52074, 52084, 52092, 52101, 52160, 52229, 52233, 52272, 52283, 52286, 52556, 52566

NECROSIS
52677, 52686, 52688, 52689, 52709

NERVOUS SYSTEM
52587, 52607, 52628, 52629, 52631, 52633, 52639, 52644, 52795

NETHERLANDS
52103, 52114, 52511, 52524, 52616, 52620, 52621, 52717, 52733, 52734, 52784, 52787

NEUTRAL CONDITION
52498

NEUTRON ACTIVATION ANALYSIS
52402, 52403, 52555

NEW YORK STATE
52411

NICKEL COMPOUNDS
52054, 52059, 52360, 52378, 52387, 52404, 52430, 52432, 52447, 52464, 52471, 52569, 52640, 52695

NITRATES
52199, 52394, 52430, 52432, 52460, 52461, 52548, 52651, 52660, 52661, 52677, 52686, 52690, 52697, 52699

NITRIC ACID
52548, 52731

NITRIC OXIDE (NO)
52050, 52056, 52062, 52083, 52089, 52093, 52114, 52139, 52168, 52184, 52194, 52207, 52210, 52239, 52242, 52243, 52254, 52280, 52319, 52324, 52350, 52394, 52426, 52427, 52434, 52444, 52454, 52463, 52468, 52473, 52486, 52500, 52521, 52547, 52548, 52549, 52557, 52562, 52563, 52565, 52566, 52572, 52583, 52604, 52605, 52622, 52635, 52649, 52776, 52779, 52795

NITRITES
52649, 52692

NITROGEN
52265

NITROGEN DIOXIDE (NO2)
52056, 52062, 52077, 52081, 52089, 52093, 52105, 52114, 52194, 52207, 52242, 52280, 52286, 52319, 52324, 52342, 52348, 52354, 52368, 52370, 52373, 52394, 52395, 52408, 52413, 52419, 52426, 52427, 52443, 52444, 52450, 52454, 52463, 52473, 52478, 52486, 52487, 52495, 52500, 52521, 52547, 52548, 52571, 52583, 52591, 52594, 52600, 52604, 52606, 52614, 52615, 52616, 52622, 52635, 52642, 52644, 52645, 52654, 52682, 52692, 52693, 52705, 52723, 52727, 52744, 52749, 52761, 52776, 52779, 52785, 52795

NITROGEN ORGANIC COMPOUNDS
52135, 52223, 52298, 52332, 52352, 52416, 52433, 52458, 52487, 52493, 52552, 52772

NITROGEN OXIDES
52050, 52051, 52056, 52059, 52062, 52063, 52070, 52074, 52077, 52081, 52083, 52089, 52091, 52093, 52094, 52095, 52097, 52098, 52099, 52100, 52102, 52105, 52107, 52108, 52112, 52114, 52126, 52132, 52133, 52139, 52147, 52150, 52157, 52160, 52162, 52163, 52164, 52168, 52170, 52171, 52172, 52177, 52184, 52185, 52186, 52188, 52191, 52193, 52194, 52196, 52205, 52207, 52210, 52213, 52215, 52217, 52219, 52221, 52224, 52225, 52229, 52232, 52233, 52235, 52237, 52238, 52239, 52242, 52243, 52245, 52247, 52254, 52257, 52261, 52265, 52267, 52275, 52276, 52277, 52278, 52280, 52286, 52292, 52293, 52294, 52306, 52311, 52319, 52322, 52324, 52331, 52342, 52348, 52350, 52354, 52364, 52366, 52368, 52370, 52373, 52392, 52394, 52395, 52397, 52399, 52408, 52413, 52417, 52419, 52425, 52426, 52427, 52434, 52437, 52441, 52443, 52444, 52449, 52450, 52454, 52463, 52464, 52468, 52473, 52476, 52478, 52486, 52487, 52494, 52495, 52500, 52501, 52503, 52521, 52547, 52548, 52549, 52554, 52557, 52561, 52562, 52563, 52565, 52566, 52571, 52572, 52576, 52579, 52583, 52591, 52593, 52594, 52595, 52597, 52600, 52604,

52605, 52606, 52614, 52615, 52616, 52618, 52622, 52629, 52635, 52642, 52644, 52645, 52649, 52654, 52657, 52665, 52682, 52692, 52693, 52705, 52708, 52710, 52711, 52720, 52721, 52723, 52725, 52727, 52728, 52731, 52737, 52743, 52744, 52747, 52748, 52749, 52751, 52759, 52761, 52766, 52775, 52776, 52777, 52778, 52779, 52780, 52785, 52795, 52797

NITROUS ACID
52500

NITROUS OXIDE (N2O)
52487, 52561

NON-METROPOLITAN AREAS
52053, 52076, 52148, 52451, 52462, 52520, 52536, 52550, 52609, 52640, 52655, 52678

NOSE
52582

NUCLEAR EXPLOSIONS
52505

NUCLEAR POWER
52057, 52272

NUCLEAR POWER PLANTS
52057, 52084, 52145, 52262, 52645, 52797

NUCLEATION
52505

NUCLEIC ACIDS
52594, 52633

O

OCEANS
52057, 52422, 52430, 52438, 52518, 52550

ODOR CONTROL
52121, 52138, 52142, 52148, 52149, 52178, 52180, 52198, 52209, 52216, 52226, 52227, 52231, 52234, 52263, 52266, 52296, 52309, 52429, 52493, 52553, 52700, 52758, 52771, 52795

ODOR COUNTERACTION
52121, 52138, 52142, 52148, 52149, 52178, 52180, 52198, 52209, 52216, 52226, 52227, 52231, 52234, 52263, 52266, 52296, 52309, 52429, 52493, 52553, 52700, 52758, 52771, 52795

ODORIMETRY
52234, 52329, 52355, 52385

ODOROUS POLLUTANTS
52053, 52076, 52087, 52121, 52136, 52140, 52142, 52148, 52149, 52151, 52180, 52198, 52209, 52216, 52223, 52224, 52226, 52227, 52231, 52234, 52255, 52263, 52266, 52296, 52309, 52329, 52336, 52347, 52355, 52364, 52385, 52410, 52416, 52429, 52433, 52439, 52458, 52493, 52553, 52700, 52758, 52760, 52765, 52771, 52772, 52789, 52793, 52795

OIL BURNERS
52070, 52154, 52168, 52172, 52217, 52233, 52316

OLEFINS
52393, 52424, 52538, 52548, 52554, 52570, 52578, 52662, 52682

OPERATING CRITERIA
52645, 52733, 52770

OPERATING VARIABLES
52051, 52062, 52064, 52085, 52088, 52093, 52095, 52108, 52114, 52122, 52139, 52141, 52144, 52145, 52148, 52149, 52150, 52152, 52154, 52165, 52174, 52177, 52178, 52188, 52195, 52209, 52210, 52212, 52216, 52220, 52226, 52237, 52246, 52252, 52254, 52256, 52257, 52258, 52261, 52265, 52268, 52271, 52279, 52284, 52285, 52289, 52293, 52295, 52305, 52306, 52307, 52310, 52314, 52319, 52324, 52326, 52328, 52333, 52334, 52340, 52343, 52347, 52352, 52353, 52361, 52365, 52373, 52381, 52395, 52399, 52400, 52401, 52402, 52429, 52522, 52524, 52536, 52540, 52545, 52551, 52552, 52558, 52559, 52562, 52563, 52565, 52572, 52589, 52654, 52666, 52687, 52693, 52722, 52730, 52763

OPINION SURVEYS
52789, 52792, 52793

OPTICAL METHODS
52575

OREGON
52632

ORGANIC ACIDS
52226, 52227, 52278, 52347, 52616, 52649

ORGANIC WASTES
52148, 52149, 52178, 52180, 52216

ORGANOMETALLICS
52633

OSAKA
52099, 52221, 52448, 52475, 52483, 52514, 52525, 52590, 52613, 52626, 52743, 52792

OUTPATIENT VISITS
52632

OVERFIRE AIR
52247

OXIDANTS
52099, 52364, 52366, 52377, 52394, 52417, 52423, 52427, 52444, 52448, 52449, 52453, 52467, 52468, 52473, 52475, 52478, 52495, 52500, 52510, 52519, 52525, 52528, 52583, 52587, 52615, 52616, 52623, 52634, 52635, 52642, 52643, 52652, 52656, 52657, 52659, 52675, 52676, 52680, 52686, 52688, 52689, 52690, 52703, 52704, 52720, 52723, 52727, 52731, 52749, 52757, 52761, 52762, 52776, 52779, 52785

OXIDATION
52126, 52178, 52180, 52194, 52198, 52205, 52236, 52266, 52277, 52478, 52487, 52542, 52579, 52795

OXYGEN
52192, 52215, 52243, 52418, 52487, 52493, 52500, 52538, 52542, 52548, 52565, 52566, 52570, 52622

OZONE
52091, 52180, 52198, 52263, 52280, 52373, 52377, 52394, 52478, 52486, 52487, 52500, 52502, 52503, 52517, 52542, 52548, 52554, 52587, 52600, 52611, 52615, 52616, 52618, 52625, 52634, 52644, 52651, 52658, 52659, 52661, 52666, 52667, 52673, 52682, 52685, 52686, 52687, 52689, 52690, 52694, 52697, 52698, 52705, 52711

P

PAINTS
52049, 52711

PAINTS AND ALLIED PRODUCTION
52209

PAPER AND ALLIED MANUFACTURING
52053, 52121, 52231, 52321, 52385, 52458, 52493

PAPER CHROMATOGRAPHY
52323

PAPER MILLS
52493

PARIS
52390, 52415

PARTICLE COUNTING
52327, 52335, 52337, 52358, 52369, 52438, 52545

PARTICLE GROWTH
52078, 52492, 52535, 52559, 52564, 52573

PARTICLE INVESTIGATION METHODS
52080, 52116, 52327, 52335, 52337, 52338, 52358, 52369, 52380, 52387, 52404, 52406, 52438, 52513, 52545

PARTICLE SEPARATION
52338, 52380, 52387, 52404, 52406

PARTICLE SHAPE
52531, 52551

PARTICLE SIZE
52078, 52129, 52358, 52360, 52363, 52369, 52422, 52438, 52445, 52472, 52479, 52492, 52499, 52504, 52505, 52531, 52535, 52539, 52540, 52545, 52550, 52551, 52585, 52588, 52650

PARTICULATE CLASSIFICATION METHODS
52382, 52400, 52482, 52559

PARTICULATE SAMPLING
52363, 52365, 52374, 52382, 52406, 52440, 52472

PATHOLOGICAL TECHNIQUES
52585, 52593, 52606, 52611, 52612, 52619, 52640, 52643, 52650, 52651, 52660, 52691, 52699

PENTANES
52424

PERFORMANCE STANDARDS
52063, 52079, 52123, 52200, 52250, 52465, 52507, 52718, 52719, 52720, 52721, 52722, 52723, 52725, 52726, 52728, 52731, 52732, 52733, 52734, 52735, 52747, 52748, 52750, 52752, 52753, 52756, 52761, 52762, 52767, 52769, 52780, 52788

PERMEABILITY
52649, 52708

PEROXIDES
52094, 52711

PEROXYACETYL NITRATE
52394, 52548, 52651, 52660, 52661, 52686, 52690, 52699

PEROXYACYL NITRATES
52394, 52548, 52651, 52660, 52661, 52677, 52686, 52690, 52697, 52699

PERSONNEL
52617

PESTICIDES
52536

PETER SPENCE PROCESS (CLAUS)
52212, 52296

PETROLEUM AND COAL PRODUCTS INDUSTRY
52114, 52224, 52225, 52270, 52662, 52733, 52772

PETROLEUM DISTRIBUTION
52733

PETROLEUM PRODUCTION
52270

PETROLEUM REFINING
52114, 52224, 52225, 52270, 52662, 52733, 52772

PETUNIA
52699

PH
52199, 52248, 52425, 52497, 52499, 52636, 52683, 52701, 52744, 52762

PHENOLS
52226, 52227, 52547

PHENYL COMPOUNDS
52049, 52332, 52439

PHENYLS
52049, 52439

PHOSPHORUS COMPOUNDS
52559

PHOSPHORUS ORGANIC COMPOUNDS
52536

PHOTOCHEMICAL REACTIONS
52091, 52475, 52478, 52486, 52487, 52493, 52495, 52500, 52502, 52538, 52542, 52547, 52548, 52554, 52557, 52576, 52577, 52578, 52629, 52654, 52661, 52692, 52711, 52757

PHOTOGRAPHIC METHODS
52677, 52679

PHOTOLYSIS
52478, 52493, 52711

PHOTOMETRIC METHODS
52322, 52328, 52358, 52382, 52551, 52638

PHOTOOXIDATION
52493, 52757

PHOTOSYNTHESIS
52662, 52671, 52687

PHYTOTOXICANTS
52657

PILOT PLANTS
52139, 52261

PLANNING AND ZONING
52105, 52718, 52722, 52753, 52754, 52755, 52768, 52782, 52786, 52788

PLANT DAMAGE
52437, 52510, 52652, 52654, 52655, 52656, 52658, 52660, 52661, 52662, 52664, 52666, 52667, 52672, 52673, 52675, 52676, 52677, 52678, 52680, 52681, 52682, 52684, 52685, 52686, 52688, 52689, 52690, 52691, 52692, 52693, 52694, 52695, 52696, 52697, 52698, 52699, 52702, 52703, 52704, 52705, 52706, 52709, 52729, 52731, 52775

PLANT GROWTH AND DEVELOPMENT
52652, 52662, 52665, 52671, 52674, 52679, 52687, 52688, 52694, 52702, 52706, 52709, 52797

PLANT INDICATORS
52652, 52658, 52659, 52664, 52669, 52672, 52674, 52676, 52682, 52686, 52688, 52690, 52697, 52703, 52704

PLASTICS
52064, 52134, 52208, 52278, 52386, 52571, 52710

PLUME BEHAVIOR
52118, 52354, 52512, 52533

PNEUMOCONIOSIS
52220, 52644

POLAROGRAPHIC METHODS
52364

POLYNUCLEAR COMPOUNDS
52103, 52288, 52323, 52325, 52344, 52381, 52410, 52592, 52620, 52621

POTASSIUM COMPOUNDS
52199, 52360, 52402, 52403, 52447

POTENTIOMETRIC METHODS
52357, 52392, 52636, 52787

POWER CYCLES
52084

POWER SOURCES
52044, 52050, 52057, 52065, 52066, 52067, 52069, 52071, 52078, 52080, 52084, 52089, 52094, 52104, 52108, 52112, 52114, 52117, 52130, 52131, 52137, 52143, 52155, 52157, 52164, 52175, 52176, 52177, 52184, 52189, 52193, 52210, 52213, 52214, 52239, 52245, 52246, 52249, 52252, 52253, 52255, 52258, 52272, 52276, 52281, 52285, 52288, 52292, 52294, 52300, 52315, 52721

PRECIPITATION
52376, 52413, 52423, 52425, 52456, 52457, 52468, 52476, 52497, 52499, 52505, 52512, 52517, 52531, 52535, 52653, 52683, 52744, 52762

PRESSURE (ATMOSPHERIC)
52514, 52521

PRIMARY METALLURGICAL PROCESSES
52070, 52101, 52133, 52163, 52170, 52241, 52242, 52556, 52716

PRINTING AND PUBLISHING
52209

PROCESS MODIFICATION
52062, 52080, 52111, 52113, 52114, 52118, 52121, 52132, 52133, 52154, 52162, 52163, 52168, 52170, 52171, 52172, 52186, 52217, 52219, 52225, 52228, 52229, 52232, 52233, 52235, 52238, 52241, 52242, 52244, 52247, 52254, 52257, 52264, 52275, 52276, 52279, 52292, 52302, 52304, 52311, 52316, 52540, 52722, 52797

PROPANES
52130, 52393, 52572

PROPENES
52393, 52424, 52548, 52554

PROPIONALDEHYDES
52384, 52439

PROPOSALS
52735, 52753, 52788

PROTEINS
52593, 52594, 52621, 52638, 52649

PUBLIC AFFAIRS
52076, 52081, 52419, 52715, 52739, 52744, 52760, 52770, 52771, 52772, 52782, 52789, 52792, 52793

PUBLIC INFORMATION
52081, 52419

PULMONARY FUNCTION
52622

PULP MILLS
52053, 52121, 52231, 52321, 52385, 52458

PYRENES
52323, 52592

PYRIDINES
52298

Q

QUESTIONNAIRES
52082, 52789, 52792, 52793

R

RABBITS
52605, 52611

RADIATION MEASURING SYSTEMS
52410

RADIOACTIVE RADIATION
52343, 52360, 52365, 52374, 52380, 52487, 52505, 52645

RADIOACTIVE TRACERS
52643

RADIOLOGICAL HEALTH
52601

RADON
52545

RAIN
52413, 52423, 52425, 52468, 52476, 52497, 52499, 52531, 52535, 52683, 52744, 52762

RANKINE CYCLE ENGINES
52281

RATS
52574, 52594, 52605, 52614, 52625, 52650

REACTION KINETICS
52075, 52089, 52228, 52267, 52324, 52445, 52487, 52502, 52505, 52516, 52542, 52545, 52549, 52554, 52558, 52559, 52563, 52566, 52567, 52573, 52714

REACTION MECHANISMS
52078, 52091, 52114, 52221, 52298, 52475, 52487, 52493, 52502, 52505, 52531, 52535, 52538, 52539, 52542, 52548, 52553, 52558, 52559, 52561, 52563, 52565, 52566, 52567, 52570, 52573, 52585, 52593, 52649, 52683, 52696, 52711, 52759, 52766

REACTORS (NUCLEAR)
52145, 52262, 52797

RECORDING METHODS
52337, 52351, 52367, 52677, 52679

RECREATION AREAS
52520

REDUCTION
52126, 52139, 52150, 52162, 52188, 52192, 52204, 52205, 52215, 52221, 52236, 52261, 52276, 52692, 52730, 52769

REFRACTIVE INDEX
52482, 52504, 52551

REFUSE SYSTEMS
52043, 52059, 52061, 52071, 52085, 52098, 52128, 52147, 52148, 52149, 52178, 52180, 52197, 52216, 52313, 52429, 52458, 52464

REGULATIONS
52079, 52104, 52142, 52645, 52718, 52731, 52732, 52733, 52739, 52740, 52745, 52757, 52761, 52769, 52770, 52771, 52773, 52777, 52783, 52785, 52786, 52788

REPRODUCTION (BIOLOGICAL)
52627, 52637, 52639

RESEARCH METHODOLOGIES
52736, 52738

RESEARCH PROGRAMS
52072, 52736, 52738, 52741, 52759, 52766, 52775, 52785

RESIDENTIAL AREAS
52419, 52437, 52462, 52464, 52520, 52556, 52597, 52640, 52695, 52747

RESIDUAL OILS
52070, 52101, 52133, 52163, 52170, 52241, 52242, 52556, 52716

RESPIRATORY DISEASES
52220, 52580, 52582, 52584, 52586, 52589, 52590, 52591, 52595, 52596, 52599, 52600, 52601, 52604, 52608, 52611, 52613, 52615, 52617, 52619, 52630, 52632, 52644, 52648, 52789, 52795

RESPIRATORY SYSTEM
52582, 52585, 52594, 52595, 52611, 52618, 52631, 52643

RETENTION
52526, 52581, 52601, 52642, 52653, 52668, 52669, 52670, 52672, 52674, 52681, 52695, 52696, 52702, 52707, 52709

RINGELMANN CHART
52351

RIVERS
52520, 52653

ROADS
52060, 52077, 52081, 52090, 52299, 52368, 52420, 52436, 52441, 52443, 52452, 52454, 52470, 52496, 52520, 52526, 52662, 52668, 52678, 52792

ROTARY ENGINES
52108, 52255

ROTARY PISTON ENGINES
52108, 52255

RUBBER
52377, 52386

S

SAFETY EQUIPMENT
52138, 52306

SALTZMAN METHOD (NOX)
52319, 52342, 52350, 52368, 52394, 52419

SAMPLERS
52333, 52362, 52363, 52369, 52382

SAN FRANCISCO
52535

SANITARY SERVICES
52043, 52059, 52061, 52071, 52085, 52098, 52113, 52116, 52128, 52147, 52148, 52149, 52178, 52180, 52197, 52198, 52216, 52313, 52418, 52429, 52458, 52464, 52696, 52781

SCANDINAVIA
52321, 52504, 52585, 52797

SCATTERING (ATMOSPHERIC)
52504

SCRUBBERS
52045, 52071, 52084, 52113, 52116, 52144, 52149, 52152, 52174, 52178, 52197, 52198, 52211, 52251, 52265, 52278, 52279, 52284, 52295, 52302, 52304, 52305, 52313, 52317, 52730

SEA BREEZE
52467, 52525, 52527, 52528, 52529

SEA SALTS
52455, 52555

SECONDARY AIR
52276, 52279

SEDIMENTATION (CONTROL)
52313

SELENIUM COMPOUNDS
52447, 52555, 52569

SENATE HEARINGS
52721

SERVICE INDUSTRIES
52753

SETTLING PARTICLES
52054, 52059, 52075, 52099, 52105, 52113, 52119, 52125, 52128, 52134, 52147, 52154, 52158, 52171, 52173, 52183, 52194, 52197, 52199, 52203, 52208, 52211, 52218, 52220, 52222, 52224, 52229, 52233, 52250, 52251, 52255, 52256, 52258, 52260, 52265, 52269, 52279, 52280, 52288, 52304, 52312, 52313, 52317, 52327, 52337, 52387, 52404, 52409, 52410, 52420, 52428, 52431, 52432, 52434, 52435, 52449, 52455, 52456, 52457, 52460, 52461, 52463, 52464, 52468, 52469, 52471, 52473, 52474, 52482, 52498, 52526, 52539, 52541, 52555, 52569, 52575, 52588, 52597, 52601, 52638, 52647, 52691, 52695, 52706, 52716, 52725, 52757, 52789, 52797

SEWAGE TREATMENT
52116, 52180, 52198

SEWERAGE SYSTEMS
52071, 52113, 52116, 52180, 52198, 52418, 52696, 52781

SIEVE ANALYSIS
52116

SILICATES
52561

SILICON COMPOUNDS
52447, 52560, 52561, 52631

SILICON DIOXIDE
52082, 52256, 52440, 52529

SILVER COMPOUNDS
52403, 52447, 52555

SIMULATION
52050, 52067, 52069, 52072, 52091, 52095, 52259, 52368, 52481, 52489, 52500, 52507, 52531, 52578, 52749, 52762

SINTERING
52279

SKIN CANCER
52603

SLUDGE
52696, 52781

SMOG
52055, 52091, 52099, 52356, 52389, 52394, 52418, 52425, 52437, 52452, 52468, 52473, 52475, 52517, 52519, 52548, 52583, 52587, 52602, 52608, 52610, 52611, 52617, 52623, 52624, 52629, 52634, 52651, 52656, 52661, 52662, 52664, 52676, 52677, 52678, 52697, 52698, 52703, 52739, 52742, 52746, 52759, 52766, 52775, 52785, 52790, 52796

SMOG INDEX
52109

SMOKE SHADE
52351

SMOKEMETERS
52351

SMOKES
52050, 52051, 52054, 52079, 52094, 52096, 52109, 52112, 52174, 52184, 52185, 52191, 52203, 52229, 52258, 52288, 52300, 52337, 52351, 52383, 52415, 52481, 52615, 52732, 52777, 52786

SMOKING
52368, 52580, 52613

SOCIAL ATTITUDES
52786, 52789, 52791, 52792

SOCIO-ECONOMIC FACTORS
52048, 52105, 52272, 52609, 52632, 52715, 52716, 52764, 52780, 52781, 52782, 52790, 52791

SODIUM CHLORIDE
52440, 52455

SODIUM COMPOUNDS
52199, 52402, 52403, 52440, 52447, 52455, 52535

SOILING INDEX
52534

SOILS
52060, 52312, 52516, 52535, 52555, 52653, 52683, 52696, 52701, 52707

SOLAR RADIATION
52405, 52467, 52478, 52482, 52496, 52501, 52502, 52503, 52508, 52513, 52514, 52530

SOLVENTS
52098, 52209, 52226, 52227, 52228, 52543, 52607, 52753, 52772

SOOT
52054, 52059, 52075, 52128, 52154, 52171, 52203, 52229, 52255, 52258, 52265, 52288, 52471, 52725, 52789

SOURCE MONITORING
52047, 52059, 52395, 52410, 52718

SOX CONTROL
52061, 52063, 52084, 52117, 52144, 52147, 52152, 52162, 52169, 52174, 52179, 52181, 52194, 52195, 52197, 52204, 52212, 52224, 52236, 52237, 52244, 52248, 52274, 52278, 52284, 52295, 52296, 52305, 52310, 52560, 52715, 52716, 52730, 52749, 52797

SPARK IGNITION ENGINES
52104, 52108, 52114, 52164, 52252, 52255, 52276, 52285, 52294

SPARK TIMING
52189, 52252, 52276

SPECTROMETRY
52322, 52323, 52325, 52331, 52332, 52333, 52336, 52348, 52356, 52362, 52372, 52378, 52387, 52389, 52394, 52397, 52408, 52568

SPECTROPHOTOMETRY
52318, 52322, 52331, 52332, 52359, 52361, 52364, 52440

SPINACH
52665, 52705

SPOT TESTS
52391

STABILITY (ATMOSPHERIC)
52467, 52481, 52484, 52488, 52494, 52496, 52497, 52498, 52506, 52512, 52514, 52519, 52520, 52521, 52525, 52530, 52532, 52537

STACK GASES
52051, 52054, 52059, 52062, 52063, 52085, 52086, 52087, 52088, 52093, 52095, 52101, 52102, 52109, 52114, 52117, 52122, 52126, 52127, 52128, 52135, 52139, 52147, 52149, 52150, 52151, 52153, 52154, 52161, 52162, 52165, 52178, 52188, 52191, 52194, 52195, 52197, 52198, 52204, 52207, 52212, 52215, 52229, 52234, 52235, 52237, 52248, 52250, 52251, 52256, 52257, 52261, 52264, 52269, 52274, 52275, 52278, 52279, 52280, 52296, 52297, 52304, 52305, 52311, 52313, 52316, 52321, 52326, 52354, 52357, 52383, 52395, 52412, 52425, 52474, 52511, 52512, 52522, 52533, 52575, 52601, 52645, 52655, 52670, 52684, 52704, 52713, 52716, 52722, 52730, 52731, 52736, 52750, 52751, 52756, 52769, 52797

STACK MONITORING
52047, 52059, 52395

STACKS
52128, 52154, 52316, 52533, 52797

STAGNATION
52525

STATE GOVERNMENTS
52732

STATIONARY EMISSION SOURCES
52043, 52044, 52045, 52047, 52051, 52052, 52053, 52054, 52055, 52057, 52059, 52060, 52061, 52063, 52064, 52067, 52070, 52071, 52073, 52074, 52076, 52079, 52083, 52084, 52085, 52086, 52087, 52088, 52092, 52093, 52095, 52096, 52098, 52099, 52101, 52102, 52103, 52104, 52105, 52107, 52108, 52109, 52113, 52114, 52115, 52116, 52117, 52118, 52121, 52122, 52123, 52126, 52128, 52129, 52132, 52133, 52138, 52139, 52144, 52145, 52147, 52148, 52149, 52153, 52154, 52156, 52157, 52160, 52163, 52165, 52168, 52170, 52171, 52172, 52178, 52180, 52185, 52186, 52187, 52194, 52197, 52198, 52204, 52205, 52209, 52216, 52217, 52220, 52224, 52225, 52228, 52229, 52231, 52232, 52233, 52235, 52241, 52242, 52246, 52249, 52250, 52251, 52254, 52256, 52257, 52259, 52262, 52264, 52265, 52266, 52270, 52272, 52274, 52275, 52277, 52279, 52280, 52283, 52286, 52288, 52291, 52293, 52294, 52296, 52297, 52300, 52302, 52304, 52309, 52310, 52312, 52313, 52316, 52317, 52321, 52326, 52356, 52385, 52411, 52416, 52418, 52421, 52425, 52428, 52429, 52432, 52433, 52434, 52435, 52446, 52451, 52458, 52464, 52471, 52473, 52474, 52493, 52505, 52507, 52522, 52536, 52540, 52550, 52556, 52563, 52566, 52572, 52595, 52601, 52603, 52617, 52638, 52645, 52653, 52655, 52662, 52665, 52669, 52670, 52684, 52691, 52695, 52696, 52704, 52713, 52716, 52717, 52718, 52719, 52722, 52723, 52725, 52730, 52731, 52733, 52734, 52736, 52745, 52746, 52749, 52751, 52753, 52756, 52757, 52758, 52763, 52765, 52772, 52778, 52781, 52782, 52786, 52788, 52797

STATISTICAL ANALYSES
52355, 52383, 52435, 52437, 52472, 52478, 52479, 52488, 52490, 52504, 52505, 52511, 52515, 52519, 52522, 52537, 52582, 52583, 52595, 52598, 52599, 52613, 52619, 52630, 52632, 52638, 52652, 52674, 52675, 52679, 52715, 52792

STEAM
52118

STEAM ELECTRIC POWER GENERATION
52057, 52084, 52101, 52122, 52645, 52691, 52763

STEAM ENGINES
52281

STEEL
52714

STOMACH
52628

STONE
52146

STRATIFIED CHARGE ENGINES
52104, 52239, 52252, 52255, 52276, 52721

STREETS
52077, 52090, 52368, 52436, 52441, 52443, 52452, 52454, 52470, 52496, 52520, 52526

STRUCTURES
52058, 52074, 52097, 52269, 52299, 52363, 52435

STYRENES
52049, 52439

SUBLIMATION
52071

SUBSURFACE STRUCTURES
52058

SULFATES
52199, 52315, 52379, 52413, 52430, 52432, 52440, 52456, 52457, 52460, 52461, 52476, 52493, 52499, 52567

SULFIDES
52053, 52082, 52121, 52161, 52178, 52180, 52212, 52223, 52226, 52231, 52248, 52265, 52296, 52321, 52328, 52329, 52331, 52366, 52392, 52416, 52418, 52433, 52449, 52458, 52493, 52607, 52649, 52772

SULFITES
52278, 52567

SULFUR COMPOUNDS
52053, 52078, 52082, 52121, 52161, 52178, 52180, 52195, 52199, 52212, 52223, 52226, 52231, 52248, 52265, 52278, 52296, 52315, 52321, 52328, 52329, 52331, 52366, 52379, 52392, 52413, 52416, 52418, 52430, 52432, 52433, 52440, 52447, 52449, 52456, 52457, 52458, 52460, 52461, 52476, 52493, 52499, 52555, 52567, 52607, 52649, 52674, 52733, 52734, 52736, 52756, 52757, 52772

SULFUR DIOXIDE
52047, 52054, 52059, 52099, 52102, 52105, 52128, 52139, 52141, 52147, 52153, 52162, 52215, 52243, 52248, 52261, 52319, 52324, 52328, 52330, 52334, 52353, 52364, 52368, 52373, 52379, 52390, 52392, 52399, 52401, 52411, 52412, 52413, 52414, 52415, 52418, 52421, 52425, 52428, 52431, 52434, 52442, 52452, 52453, 52463, 52464, 52468, 52475, 52476, 52477, 52481, 52488, 52493, 52499, 52500, 52506, 52511, 52518, 52521, 52522, 52523, 52527, 52537, 52538, 52542, 52548, 52567, 52568, 52571, 52576, 52577, 52585, 52586, 52593, 52613, 52615, 52628, 52642, 52644, 52645, 52651, 52655, 52664, 52670, 52671, 52681, 52682, 52683, 52689, 52704, 52705, 52706, 52707, 52708, 52711, 52713, 52714, 52718, 52723, 52727, 52735, 52740, 52763, 52787, 52797

SULFUR ORGANIC COMPOUNDS
52053, 52121, 52180, 52226, 52231, 52234, 52290, 52328, 52329, 52416, 52433, 52458, 52493, 52772

SULFUR OXIDES
52047, 52054, 52059, 52098, 52099, 52102, 52105, 52128, 52139, 52141, 52147, 52150, 52153, 52162, 52215, 52229, 52243, 52248, 52261, 52286, 52319, 52324, 52328, 52330, 52331, 52334, 52353, 52359, 52364, 52366, 52368, 52373, 52379, 52380, 52390, 52392, 52399, 52401, 52411, 52412, 52413, 52414, 52415, 52418, 52421, 52425, 52428, 52431, 52434, 52437, 52442, 52446, 52449, 52450, 52451, 52452, 52453, 52463, 52464, 52468, 52469, 52473, 52474, 52475, 52476, 52477, 52481, 52483, 52484, 52488, 52490, 52493, 52494, 52499, 52500, 52506, 52509, 52511, 52517, 52518, 52521, 52522, 52523, 52527, 52537, 52538, 52542, 52548, 52567, 52568, 52571, 52576, 52577, 52584, 52585, 52586, 52593, 52597, 52613, 52615, 52619, 52628, 52635, 52642, 52644, 52645, 52651, 52655, 52664, 52670, 52671, 52681, 52682, 52683, 52684, 52689, 52702, 52704, 52705, 52706, 52707, 52708, 52711, 52713, 52714, 52716, 52718, 52719, 52722, 52723, 52725, 52726, 52727, 52728, 52729, 52732, 52735, 52740, 52743, 52745, 52747, 52750, 52751, 52756, 52757, 52762, 52763, 52776, 52777, 52778, 52779, 52787, 52797

SULFUR TRIOXIDE
52147, 52380, 52399, 52412, 52449, 52451, 52463, 52464, 52469, 52542, 52576

SULFURIC ACID
52406, 52493, 52548, 52625, 52683, 52711

SURFACE COATING OPERATIONS
52144, 52209

SURFACE COATINGS
52049, 52711, 52712

SURFACE PROPERTIES
52543

SURVEY METHODS
52240, 52651, 52779

SUSPENDED PARTICULATES
52045, 52050, 52051, 52054, 52055, 52060, 52079, 52085, 52091, 52094, 52096, 52098, 52099, 52100, 52109, 52112, 52122, 52129, 52147, 52174, 52184, 52185, 52191, 52203, 52229, 52258, 52265, 52280, 52288, 52300, 52302, 52318, 52337, 52351, 52356, 52363, 52366, 52369, 52374, 52381, 52383, 52389, 52394, 52402, 52406, 52415, 52418, 52425, 52430, 52435, 52437, 52449, 52452, 52456, 52468, 52473, 52475, 52477, 52481, 52493, 52517, 52519, 52535, 52540, 52548, 52583, 52587, 52602, 52608, 52610, 52611, 52615, 52617, 52619, 52623, 52624, 52625, 52629, 52632, 52634, 52642, 52647, 52651, 52656, 52661, 52662, 52664, 52676, 52677, 52678, 52697, 52698, 52703, 52723, 52727, 52732, 52739, 52742, 52746, 52759, 52766, 52775, 52776, 52777, 52785, 52786, 52790, 52796

SWEDEN
52321, 52585, 52797

SYNERGISM
52240, 52585, 52588, 52606, 52618, 52622, 52642, 52651, 52654, 52705

T

TAXATION
52104, 52720

TEFLON
52208

TEMPERATURE
52070, 52071, 52078, 52129, 52243, 52334, 52405, 52561, 52562, 52566, 52567

TEMPERATURE (ATMOSPHERIC)
52467, 52468, 52485, 52492, 52494, 52497, 52508, 52512, 52520, 52521, 52523, 52530, 52635, 52776

TEST ENGINES
52293, 52294

TEXTILE MILLS
52458, 52781

THERMAL RADIATION
52520

THERMODYNAMICS
52228, 52542, 52543, 52561

THIN-LAYER CHROMATOGRAPHY
52323, 52325, 52381

THRESHOLDS
52355, 52641, 52666, 52688, 52690, 52705

TIMED FUEL INJECTION
52080, 52104, 52190, 52252, 52285

TIN COMPOUNDS
52085, 52631, 52640

TIP BURN
52689

TISSUES
52361, 52581, 52616, 52622, 52631, 52639, 52649, 52650, 52651, 52660, 52670, 52699, 52707

TITANIUM COMPOUNDS
52360, 52447

TOBACCO
52659, 52666, 52667, 52673

TOKYO
52055, 52081, 52107, 52368, 52377, 52389, 52413, 52419, 52424, 52425, 52436, 52444, 52448, 52459, 52466, 52467, 52475, 52488, 52500, 52520, 52537, 52583, 52626, 52653, 52668, 52674, 52686, 52731, 52768, 52770, 52771, 52781

TOLUENES
52049, 52151, 52226, 52227, 52362, 52393, 52424, 52557, 52607

TOMATOES
52685

TOPOGRAPHIC INTERACTIONS
52099, 52105, 52421, 52480, 52494, 52506, 52520, 52521, 52684

TOXIC TOLERANCES
52585, 52591, 52614, 52615, 52625, 52652, 52654, 52656, 52658, 52659, 52660, 52662, 52666, 52673, 52678, 52681, 52682, 52684, 52685, 52687, 52688, 52690, 52692, 52693, 52694, 52696, 52699, 52702, 52704, 52705, 52706, 52709

TOXICITY
52048, 52087, 52240, 52437, 52585, 52587, 52593, 52603, 52606, 52611, 52615, 52625, 52627, 52637, 52642, 52643, 52645, 52646, 52647, 52649, 52650, 52651, 52652, 52654, 52660, 52661, 52664, 52666, 52667, 52672, 52677, 52678, 52680, 52681, 52682, 52686, 52687, 52688, 52689, 52690, 52692, 52696, 52698, 52699, 52703, 52704, 52705, 52706, 52708, 52717, 52735, 52785, 52797

TRACE ANALYSIS
52333, 52343, 52372, 52402, 52517, 52560, 52631, 52695

TRACERS
52474, 52533, 52643, 52701

TRANS-2-BUTENE
52578

TRANSPORT
52411, 52416, 52422, 52429, 52431, 52433, 52434, 52442, 52474, 52483, 52526, 52536, 52653, 52684

TRANSPORTATION METHODS
52055, 52056, 52058, 52068, 52069, 52072, 52077, 52083, 52090, 52091, 52097, 52098, 52099, 52102, 52107, 52120, 52124, 52129, 52155, 52164, 52166, 52182, 52192, 52196, 52200, 52210, 52245, 52246, 52249, 52252, 52255, 52259, 52282, 52301, 52303, 52306, 52308, 52356, 52368, 52408, 52419, 52425, 52434, 52436, 52441, 52443, 52454, 52466, 52468, 52473, 52475, 52486, 52491, 52503, 52526, 52556, 52634, 52668, 52704, 52720, 52733, 52748, 52759, 52768, 52769, 52779, 52780, 52781, 52786, 52788, 52790, 52792, 52793

TRAPPING (SAMPLING)
52324, 52353

TREES
52526, 52651, 52655, 52661, 52668, 52670, 52674, 52679, 52681, 52683, 52684, 52687, 52704, 52708, 52709

TRENDS
52056, 52057, 52076, 52098, 52102, 52104, 52123, 52165, 52181, 52323, 52356, 52415, 52425, 52426, 52428, 52434, 52437, 52446, 52450, 52457, 52463, 52469, 52474, 52477, 52491, 52502, 52503, 52521, 52530, 52580, 52583, 52602, 52631, 52668, 52669, 52715, 52716, 52720, 52731, 52746, 52749, 52755, 52760, 52761, 52786

TRUCKS
52069, 52083, 52164

TUMORS
52606, 52642

TUNNELS
52058

TURBIDIMETRY
52080, 52513

TURBULENCE (ATMOSPHERIC)
52505, 52512, 52515, 52558

U

ULTRAVIOLET RADIATION
52280, 52371, 52502, 52503, 52517, 52528, 52577, 52635

ULTRAVIOLET SPECTROMETRY
52322, 52394, 52397

UNITED KINGDOM
52569, 52784

UNITED STATES
52102, 52411, 52535, 52583, 52632, 52683, 52724, 52797

URBAN AREAS
52056, 52060, 52076, 52081, 52099, 52368, 52381, 52400, 52413, 52414, 52417, 52418, 52420, 52423, 52424, 52426, 52427, 52428, 52431, 52432, 52434, 52436, 52440, 52441, 52442, 52443, 52444, 52446, 52449, 52450, 52451, 52452, 52453, 52457, 52459, 52463, 52465, 52466, 52468, 52469, 52470, 52473, 52474, 52475, 52477, 52485, 52488, 52494, 52496, 52506, 52514, 52517, 52518, 52519, 52521, 52523, 52526, 52528, 52530, 52537, 52550, 52580, 52581, 52582, 52583, 52586, 52601, 52608, 52609, 52610, 52612, 52613, 52619, 52623, 52626, 52632, 52645, 52647, 52648, 52653, 52656, 52662, 52664, 52679, 52680, 52686, 52702, 52703, 52720, 52726, 52731, 52743, 52760, 52766, 52768, 52770, 52771, 52772, 52779, 52781, 52789

URINE
52636, 52641

USSR
52240, 52265, 52268, 52317, 52341, 52379, 52391, 52513, 52534, 52536, 52559, 52564, 52628, 52649, 52708, 52724

V

VALLEYS
52091

VANADIUM COMPOUNDS
52360, 52402, 52403, 52420, 52430, 52447, 52464, 52535, 52560, 52569

VAPOR PRESSURE
52088, 52334

VAPOR RECOVERY SYSTEMS
52167, 52252

VAPORS
52064, 52088, 52118, 52209, 52302, 52486, 52501, 52513

VEGETABLES
52654, 52662, 52663, 52665, 52676, 52677, 52678, 52685, 52686, 52691, 52692, 52693, 52698, 52705, 52707

VENTILATION
52074, 52097, 52220, 52269

VENTURI SCRUBBERS
52278, 52302, 52317

VIRUSES
52619

VISIBILITY
52461, 52521, 52528, 52537

VISIBLE RADIATION
52528

VOLATILITY
52085, 52088, 52231, 52334, 52493, 52588

VOLTAGE
52314

W

WASHINGTON (STATE)
52683

WASHOUT
52499, 52505, 52517, 52531

WASTE GAS CONTROL
52061, 52063, 52084, 52117, 52144, 52147, 52152, 52162, 52169, 52174, 52179, 52181, 52194, 52195, 52197, 52204, 52212, 52224, 52236, 52237, 52244, 52248, 52274, 52278, 52284, 52295, 52296, 52305, 52310, 52560, 52715, 52716, 52730, 52749, 52797

WASTE GASES
52051, 52054, 52059, 52062, 52063, 52085, 52086, 52087, 52088, 52093, 52095, 52101, 52102, 52109, 52114, 52117, 52122, 52126, 52127, 52128, 52135, 52139, 52147, 52149, 52150, 52151, 52153, 52154, 52161, 52162, 52165, 52178, 52188, 52191, 52194, 52195, 52197, 52198, 52204, 52207, 52212, 52215, 52229, 52234, 52235, 52237, 52248, 52250, 52251, 52256, 52257, 52261, 52264, 52269, 52274, 52275, 52278, 52279, 52280, 52296, 52297, 52304, 52305, 52311, 52313, 52316, 52321, 52326, 52354, 52357, 52383, 52395, 52412, 52425, 52474, 52511, 52512, 52522, 52533, 52575, 52601, 52645, 52655, 52670, 52684, 52704, 52713, 52716, 52722, 52730, 52731, 52736, 52750, 52751, 52756, 52769, 52797

WATER
52049, 52127, 52333, 52486, 52501, 52513, 52542, 52548

WATER BODIES
52082, 52221, 52225, 52263, 52760, 52781, 52794

WATER POLLUTION
52082, 52221, 52225, 52263, 52760, 52781, 52794

WEATHER MODIFICATION
52485, 52501, 52508, 52520

WEST AND GAEKE METHOD (SO2)
52345, 52411

WET CYCLONES
52313, 52317

WETTING
52541

WIND ROSE
52529

WIND TUNNELS
52474, 52480, 52506, 52509, 52533

WINDS
52072, 52390, 52411, 52416, 52421, 52422, 52431, 52433, 52442, 52456, 52466, 52467, 52468, 52471, 52476, 52477, 52481, 52485, 52488, 52494, 52496, 52497, 52506, 52510, 52512, 52514, 52518, 52521, 52523, 52525, 52527, 52528, 52529, 52537, 52776, 52779

WOOD (MATERIAL)
52207, 52386

X

X-RAYS
52343, 52360, 52365, 52374, 52380

XYLENES
52049, 52226, 52227, 52557

Y

YOKKAICHI
52439, 52519, 52612

YOKOHAMA
52060, 52462, 52488, 52496, 52521, 52580

Z

ZINC
52714

ZINC COMPOUNDS
52085, 52360, 52387, 52402, 52403, 52404, 52420, 52430, 52447, 52464, 52555, 52560, 52627, 52631, 52640, 52647, 52653, 52663, 52695, 52696

AUTHOR INDEX

A

ABE K *52580
ABE S 52527
ABTHOFF J 52276
ABURAMOTO Y 52498
AKAZUKA S *52110
AKIYAMA M 52375
AMANO M *52111
AMATANI K *52318, *52319
ANDERSON S *52683
ANDO H *52370
ANDO T *52112
ANDO W *52538
ANEO M 52360
ANTON P *52736
ANTWEILER H *52644
ANZAI H *52627
AOKI K 52413
ARAI *52684
ARAI H 52151
ARAI S 52190
ARASE K *52247
ARKHIPOVA O G *52649
ARTEM YEVA L M 52534
ASAKAWA A 52444
ASAKAWA F *52685
ASAKINO K *52413
ASAMI H 52601
ASANO H 52178
ASANO S 52551
ASANO Y 52445
ASMANGULYAN A A *52628
AUSTIN R R *52248
AZUMA T 52070

B

BABUSIK I *52454
BAN Y 52469
BANNO N 52333
BARBER J C *52113
BARNISKE L *52043
BARTON K 52711, *52714
BAUDOIN P *52511
BAUMANN R *52414
BAZIKA V *52300
BEAUCAGE C 52609
BECHER J *52764
BECKER K H *52478
BENNETT L L 52084
BENOVA E *52399
BERRY C R *52704
BIMOND J P 52270
BLAYLOCK B G 52701
BLOKKER P C *52114, 52511
BLU G 52270
BOEHM J *52539
BOGARDUS H F 52314
BOHLMANN W 52164
BOKI Y 52552
BONDIETTI E A 52701
BORGHI R *52558
BORMANN B 52683
BOSSAVY J *52709
BREWER S T *52084
BRIANCON R 52196
BRILLE M G *52249
BRINKMANN U 52354
BRISSON G R 52609
BRODSKIY A A *52559
BROEMMEL W *52044
BROWN H 52785
BROWNING R S 52482
BRUEGEL P 52736
BUETTNER H 52079
BURNAY G *52109

C

CALDWELL B 52683
CAMPOS VENUTI G *52105
CAPPS W L 52696
CARLSEN K H 52736
CARNUTH W 52491, 52492
CARTRAUD P 52561
CERWENKA E 52147
CHAMBERS W S 52095
CHAMRAD J *52250
CHELEBI G A 52559
CHIBA J *52560
CHIBA M 52396
CHIKAOKA S *52251
CHISAKA F 52554
CHLOUPEK F J 52307
CHOVIN P *52629
CLARK R C 52314
CLAVAUD C 52561
COINTOT A *52561
COON C W *52252
CORTE G L *52320
CZENCZ M 52288

D

DAITOGE T 52128
DALBORG A *52321
DANA B P 52113
DANCHICK R S *52045
DANJO K 52089
DATE E 52597
DATE N *52686
DAVIS B E 52511
DAY J T 52084
DE BARY E *52479
DE LUISI J J 52482
DECOUFLET J 52196
DEL ZOTTO G *52301
DELCROIX J *52788
DELEANU M *52630
DENISON B 52683
DERBAREMDIKER M I 52265
DESCOLAS *52313
DESLANDES J V 52294
DESTREMONT H *52412
DETRIE J P *52415, *52718
DOERING H *52115
DOLEZEL B 52711
DONELLI G 52105
DROZDZ M 52593
DUBOIS L 52320
DUEMMLER F *52116
DVORNIK J *52575

E

EBERAN EBERHORST R *52046
EDGAR W D *52302
EGUCHI I 52254
ELDRED L 52683
ELLER M J 52091
ENAMA M E 52696
ENDO A 52371
ENDO H 52640
ENDO M 52216
ENDO R 52442
ESCHE M *52117

F

FALLY G 52476
FAUGERE J G 52785
FIELDING G H *52314
FILIPPOV V L *52534
FINEGOLD J G *52253
FINLAYSON B J 52548
FORWERG W *52322
FRANCIS C W 52701
FRANKLIN W D 52084
FRITZSCHE P *52118
FUCHI Y 52469
FUHR H 52075
FUJIE K *52323
FUJII K 52563
FUJII M 52404
FUJII N *52581, 52669
FUJII T *52631
FUJIMOTO G 52285, 52540
FUJIMURA K *52119
FUJIMURA N *52582
FUJISAWA K 52387
FUJIWARA S *52120
FUJIWARA T *52705
FUKAYA H *52085
FUKAYA K 52547
FUKAZAWA S 52177
FUKUDA H 52306
FUKUDA M 52634, 52635, 52666
FUKUI N *52540
FUKUI S 52547
FUKUOKA S *52583, *52651
FUKUSHIMA G 52794
FUKUTOMI J *52480
FUNAKI K 52427
FURUCHI R 52567
FURUGA C 52416
FURUHAMA S 52052
FURUKAWA A *52416, 52429, 52432, 52433, *52687
FURUKAWA K 52687
FURUKAWA M *52121, 52584
FURUKAWA T *52254

FURUTA M 52157
FURUTANI C 52432
FUSE T 52767

G

GALLOPOULOS N E *52106
GENIN P 52511
GENSHAFT A G 52317
GESCHNER R 52155
GIEBEL J *52512
GLOWIAK B *52522
GORDON S G 52091
GOTO H *52047, *52324
GOTO N *52417
GOYSA N I *52513
GRAEF V 52638
GRAMATKE J *52122
GRATZ R *52086
GREENFIELD M A 52645
GRIMMER P D 52095
GUILLERMIC A F *52316
GUTOWSKI W *52541

H

HAASE H J 52080
HAGA Y 52069
HAGIWARA S 52455
HAMAI S *52123
HAMAMOTO J 52713
HAMANAKA H *52737
HANZAWA M 52565
HARA H 52131
HARA S 52130, 52280
HARADA A 52362
HARADA Y 52597
HARMON T L 52091
HARUTA T 52598
HASE M *52124
HASEGAWA T 52384
HASHIMOTO M 52785
HASHIZUME G 52169
HASUO Y 52306
HATTA H *52652, *52688, 52699
HAUCK H 52414
HAUSKNECHT D F 52645
HAY D R *52400
HAYAKAWA S 52461
HAYASHI H *52562
HAYASHI K *52125, 52266, 52445, 52612
HAYASHI M *52481
HAYATA T 52432
HEACOCK R A *52325
HEINRICH H 52753
HERMAN B M *52482
HESEK F *52523
HETRICK S S *52303
HIDA M *52418
HIGASHIBATA H *52126
HIGASHIDA T *52048
HILLS F J 52303
HINSCH B *52326
HIOKA H *52419
HIRA M 52597
HIRA T *52455
HIRAMATSU K *52049, 52228
HIRAO F *52584
HIRAO M *52127
HIRASAWA S 52566
HIRATA H 52210
HIROSAWA I 52456, 52457
HIROTA J *52420
HIROYASU H *52050, *52051
HIRUMA M *52052
HOBKINSON S L 52511
HOFBAUER P *52255
HOFMANN F 52117
HOLMA B *52585
HONDA T 52418
HONING F W *52689
HONMA K *52327
HONMA M *52653
HONMA T *52087
HORI M 52060
HORI S 52094
HORII H *52128
HORIUCHI N 52405, 52538, 52576, 52577, 52578
HORVATH L *52256
HOSAKA H 52546
HOSHIKA Y *52328, *52329
HOSHINO Y 52627
HOSHIZAWA K *52257, *52311
HOSHO Y *52129
HOSOKAWA T 52346
HSU H H 52258
HSU P T *52258
HUBER H *52710
HUCKABEE J W 52701
HULST H C VAN DE *52524
HUETER D A *52259
HUTZINGER O 52325

I

ICHIHARA A *52330
ICHIHARA S *52130, *52131
IDAKA H 52442
IDE G 52606
IDE Y 52532
IDEHARA S *52132, *52133
IGARASHI K 52378
IGARI S 52586
IGUCHI M 52546, 52767
IIDA S *52134
IIDA Y 52633
IIJIMA T 52660, *52690
IIJIMA U 52094
IINOYA K *52260
IKEBE K 52358
IKEDA K *52135
IKEO T *52765
IKURA S 52050
IMAHASHI T 52360
IMAI 52684
IMAI T 52685
IMAMURA S *52136, 52695
IMAMURA Y *52137
IMAYA N *52138
INABA H *52261
INABA K 52546
INABA M 52135, *52766
INABA Y *52139
INAGAKI I 52691, 52695
INAGAKI K *52140, *52331
INAMIYA K 52373
INAMURA S *52691
INAZAWA K 52423
INDEN T *52654, 52692, 52693
INOUE H 52601
INOUE K *52141
INOWAKI S *52332
IONESCU A *52706
ISE H 52794
ISHIDA K *52371
ISHIGURO T *52053, *52142, 52384
ISHIHARA S 52124
ISHIHARA Y 52267
ISHII T *52372, 52554, 52567, 52700
ISHIKAWA H 52705, *52785
ISHIKAWA S 52438
ISHIKAWA T 52141
ISHIZAKI I *52421
ISOMURA H 52601
ITAI K 52636
ITO F 52346
ITO H *52143
ITO K *52373
ITO M *52054, 52430, 52431, 52432, 52433
ITO N 52461
ITO S 52346
ITO T 52176, 52191, *52333, 52373, *52422, 52424
ITO Y 52230
IVANOV N G 52628
IWABUCHI H *52586
IWAHOTO K *52055
IWAI N 52157, 52293
IWAMI H *52144
IWANAGA T *52655
IWASAKA Y *52542
IWASAKI N 52362
IWASAKI Y *52374
IWASE S *52587
IWATA M 52546, *52794
IZAWA Y 52370
IZUMI H 52211
IZUMI K 52528

J

JACQUEMIN 52109
JAHN J *52401
JAKSCH J A *52632
JAKUBOWICS S P 52696
JANECZEK K 52080
JEQUIER J C 52609
JINBO G *52588
JOERG F 52710
JOHNSON J H 52078
JOHNSON M F L 52307
JOLLIOT 52390
JOST D *52056
JUCK A 52472
JUENTGEN H *52145, *52262

K

KADOTA M 52687
KAGAWA F *52423
KAGAYA H 52546
KAJI H *52424
KAJII H 52386
KAJIYA S 52111
KAKIHAI Y *52334
KAKIMOTO H 52713
KAKUDA C 52545
KAKUDA T 52050
KALMAN S *52057
KAMADA M 52047, 52442
KAMATA R *52146
KAMMHOLZ H *52147
KANAYAMA A 52619
KANEDA K 52431
KANTER H J 52491
KAPILEVICH S B 52559
KARASUYAMA N *52148, *52149
KARINO S *52315
KASAOKA N *52150
KATAFUCHI K *52151
KATAGIRI K 52119
KATO G *52335
KATO K 52085, 52161, 52375, *52563, *52719
KATO M *52263

KATO S *52152
KATO T *52058, *52336, *52692, *52693
KATSUMATA S *52375
KATSUNUMA H 52420
KATSURAGAWA H 52447, 52555
KAWABE T 52251
KAWAGUCHI F 52627
KAWAGUCHI O 52540
KAWAHARA M 52110
KAWAHARA N 52382
KAWAI H 52640
KAWAI K *52589
KAWAI W 52371
KAWAMATA M *52656
KAWAMOTO M *52153
KAWAMURA T *52376, *52425
KAWASAKI M *52590
KAWASHIMA E 52499
KAWAUCHI K *52264
KAWAZOE K *52738
KELLER A *52154
KELLER E 52785
KELLNER K H *52426
KHRISTIANOVICH S A *52265
KIDAWARA M 52417
KIDO S 52601
KIKKAWA S 52161
KIMURA F 52500
KIMURA K *52337, *52338, 52424
KIRSCH H *52155
KISHI A 52584
KITA D 52528
KITAGAWA H *52543
KITAGAWA M *52266
KITAGAWA S *52427
KITAGAWA Y 52054, *52059, 52416, *52428, *52429, *52430, *52431, *52432, *52433
KITAMURA J 52340
KITAMURA M 52499, *52633
KITAMURA T 52458
KITANO H 52666, 52667
KITAO S 52178
KITAO Y *52156
KITASAKA M *52304
KLIMISCH R L 52106
KLOSTERKOETTER W *52650
KNELSON J H *52591
KNOTKOVA D *52711, 52714
KOBAYASHI A 52207
KOBAYASHI N 52111
KOBAYASHI S 52148, 52149, *52157, 52293, 52469, *52544
KOBAYASHI Y *52060
KOCHEL R C 52696
KODAIRA T 52285
KODAMA H 52601
KODAMA T *52339
KOGA N *52158
KOIZUMI M *52267
KOJIMA T *52159
KOMEJI T 52413
KONDO H *52340, 52458, 52584
KONDO J *52474, *52796
KONDO M 52458
KONDO S 52458
KONISHI F 52571
KONNO N 52639
KONO H 52610
KONO K 52362
KONO M 52340
KONO N 52584
KOSMIDER S *52593
KOYAMA H *52160
KOYATA K 52311
KOZLOV S T *52341
KRASOWIZKAJA K 52268
KRASOWIZKIJ J *52268
KRAUSE U 52173
KUBO T *52514, *52525
KUBOTA T 52619, *52739
KUDO K 52515
KUEBRICH J P 52307
KULICH J *52312
KUMAZAWA M *52161
KUNITOMO T 52568
KURAGASAKI M 52533
KURATA C 52563
KURE F *52728
KURITA H 52456, 52457
KUROKAWA M *52786
KURONUMA H *52515
KUROSAWA K *52061, *52162
KUROSAWA M 52274
KUROSE M *52269
KURUMIYA H *52377
KUSAKA S 52685
KUSAMA A *52163
KUSANO Y 52396
KUSUMOTO S 52605
KUSUNOKI E 52207
KUSUYA Y *52378

L

LA BARRE R 52609
LABDON D H 52511
LAESSIG V *52740
LAHMANN E *52342, *52434
LAO R C 52320
LARIVIERE G 52609
LAVALLEE H 52609
LAZARRE F *52270
LEMSTRA W 52616
LINDNER J *52594
LIYV R *52379
LOBODYUK I A 52559
LOEHNER K *52164
LOOMIS R C 52689
LOSKANT H *52595
LUCIAK M 52593
LUETZKE K *52062
LUSHNIKOV A A *52564
LUYGA P 52379, 52391

M

MACLEAN D C *52657
MAEBASHI K 52447, 52555
MAEDA I 52371
MAEDA M 52707
MAEJIMA H *52165
MAENO S 52601
MAFTEI S *52271
MAIANI L 52105
MAKI M 52124
MAKIHARA M *52063
MAKINO K 52260, 52389, *52634
MAMURO T *52343
MARKARD C 52663
MARTENS C S *52535
MARUKO S 52161
MARUOKA O 52166
MASAKI K *52166
MASAMOTO Y *52167
MASATOSHI I 52059
MASEK V *52064, *52435
MASLENNIKOV V M 52265
MASUDA N *52168, 52254
MASUDA T 52469
MASUHARA T *52436
MASUI T *52741
MASUKAWA S *52272
MASUMOTO S 52254
MATSUBARA F 52306
MATSUBARA H *52658
MATSUBAYASHI B 52439
MATSUDA H *52380, 52409
MATSUDA M *52469
MATSUI H *52169
MATSUI T 52211, 52461
MATSUMOTO A *52170
MATSUMOTO M 52418
MATSUMOTO T 52618
MATSUMURA Y *52171
MATSUMURU T *52742
MATSUNAMI M *52720
MATSUNO T *52088
MATSUO M *52172
MATSUOKA C 52458
MATSUSHITA H 52230, *52381
MATSUSHITA S *52344
MATSUUCHI M 52143
MAXEY G C 52091
MAY H 52079
MEGA K 52694
MEYER W 52117
MEYER ZU RIEMSLOH H *52173
MIGITA T 52538
MIKAMI E 52672
MILKINS E E 52294
MIMURA J 52148
MIMURA M *52305
MINAKAMI M 52357
MINEMURA K *52174
MIRUMYANTS S O 52534
MISHIMA H *52382
MITA S 52508
MITO M 52228
MITSUSE T *52516
MITSUYAMA M *52175
MIYA H 52280
MIYABE H *52065, *52176, *52306
MIYAGAWA K 52251
MIYAKE Y *52517, *52659
MIYAKI K *52066
MIYAMOTO A *52596
MIYAMOTO K *52791
MIYAMOTO M 52469
MIYAMOTO N *52177
MIYAMOTO Y *52597
MIYAO M 52584
MIYATA J *52598
MIYAUCHI T 52565
MIYAZAKI I *52437
MIYAZAKI K 52544
MIYAZAKI M 52471
MIZOGUCHI A 52459
MIZOGUCHI I 52634, *52635
MIZOKUCHI K 52389
MIZUDORI K 52546
MIZUMA M *52483
MIZUNO K 52124
MOACALU T 52706
MOLDOVAN N 52630
MONOI Y 52209
MOOI J *52307
MOORE E A 52067
MOORE J W *52067
MORI A *52273, *52599
MORI K 52178, 52563
MORI O *52383
MORI T 52309
MORI Y *52565, *52566
MORIGUCHI M *52484, *52537
MORII M 52527
MORIMOTO T 52571
MORIMURA H 52427
MORISHITA S *52178
MORITA T *52179

MORITA Y *52438
MORIWAKE T 52387
MORIYAMA H 52597
MORSHITA K 52192
MOSER F 52046
MULLER J M 52302
MUNAKATA Y *52180
MUNEMORI M *52345
MURAKAMI K *52181, 52340
MURATA M 52207, 52439, 52461
MURAYAMA M 52292
MURAYAMA T 52177
MUTSAKAS M 52084

N

NAGAI K *52439
NAGAI M 52352
NAGAI T *52182
NAGAISHI I 52070
NAGAKURA A 52489
NAGANAGA M 52540
NAGANO J *52600
NAGAO J 52295
NAGASHIMA A 52601
NAGASHIMA T *52384
NAGATA I *52601
NAGATA S 52216
NAGATA Y *52385
NAGAYAMA T *52409
NAGEL A B 52276
NAITO K *52346
NAKA K 52439
NAKAGAKI S 52612
NAKAGAWA T 52193
NAKAI S *52274
NAKAI T *52107, *52183
NAKAI Y 52619
NAKAIDO S 52538
NAKAJIMA K *52184, 52700
NAKAJIMA S 52119
NAKAJIMA T *52347, 52442, 52605
NAKAJIMA Y *52602
NAKAMORI I 52795
NAKAMURA H *52767
NAKAMURA T 52404, 52572
NAKANO M *52743
NAKANO N *52068, 52424
NAKAO H 52601
NAKASE K 52480
NAKASHIMA H *52603
NAKATA *52275
NAKATA M 52111
NAKATANI S *52545
NAKAYA S *52636
NAKAYAMA M *52185
NAKAYAMA S 52058
NAKAZAWA Y *52456, *52457
NAMIKI A *52768
NANBU A 52458
NARIKAWA S 52228
NARUKAMI H 52597
NARUSE T *52386
NATSUKAWA K 52228
NEGRUTSKAYA G M *52708
NENQUIN G *52476
NIEDING G V *52604
NIHEI H *52186
NISHI R *52089
NISHIBAYASHI N *52090
NISHIDA Y 52428
NISHIMURA H *52637, *52721
NISHIMURA K 52792
NISHIMURA Y 52129
NISHINO K *52715
NISHIOKA A *52485
NISHIYAMA K 52581
NISHIYAMA R *52546
NISHIZAKI S 52202
NIUME K 52546
NOGAMI Y *52387
NOJIMA K *52547
NOMURA O 52111
NOMURA T 52060
NOUCHI I 52658, *52660

O

O SULLIVAN J B *52108
OBLAENDER K *52276
OBRUSNIK I *52402, 52403
OCHIAI H *52348
ODA H *52605
ODA R *52277
ODAIRA T 52660, *52661
ODER R R *52187
OE M *52694
OGAKI H *52744
OGAWA I 52357
OGAWA T 52153, *52486, *52487
OGOU S *52349
OGURA T 52458
OGURA Y *52350
OHARA A *52526
OHARA T 52130, 52131
OHASHI K 52213
OHIRA T 52413
OIKAWA K *52440
OKA H *52188
OKA M *52069
OKADA J 52112
OKADA S 52218
OKAMOTO H 52532, 52533
OKAMOTO K *52189, *52745
OKAMOTO S *52488, 52490
OKAMURA H 52191
OKAWADA N 52635
OKINO H 52691, *52695
OKUBO A 52066
OKUDA K 52351
OKUDA N *52351
OKUDA S *52278
OKUMA I 52178
OKUMURA T *52352, 52375
OKURA H 52161
OKURA K *52527
OKURA T *52190
OKUTANI T *52567
OKUYAMA H 52149
OLAJEC V *52279
OMATA K 52306
OMI Y 52515
OMORI K 52112
OMOTEHARA Y *52070
ONDA H 52601
ONO C 52340, *52458
ONO I *52280
ONO J *52191
ONO S 52601
ONO Y *52192
OOTA T 52546
ORT R G 52084
OSADA T 52207
OSAWA M 52634
OSHIKA S *52193
OSHIMA K *52489
OSHIMA M *52194
OSHIMA T *52388
OSUMI M *52568
OTA H *52528, 52601
OTA K 52398
OTA S *52529
OTA T *52389
OTA Y *52459, *52662
OTAKE K 52566
OTAKE S 52549
OTAKE T 52332
OTAKI A 52488, *52490
OTANI A 52580
OTANI H 52601
OTSU H *52606
OTT R 52379
OUCHI M 52058
OYA F *52746
OYAKE T 52047, *52353, *52441, 52442
OYAMA N 52129
OYAMA T 52065
OZAKI K 52608
OZAWA M 52635
OZE Y 52178

P

PANKRAT YEVA T B *52536
PAPEZ A *52530
PATTENDEN N J *52569
PAVLOVA I V 52649
PERALMA *52390
PETERZAN P *52195
PFEILSTICKER K *52663
PIKKOV V 52379, *52391
PIS MEN M K 52265
PITTS J N 52785
PITTS J N JR *52548
PIVONKA J 52093
POCCHIARI F 52105
POETZL K 52491
POST D 52638
POSTNIKOV N N 52559
POTTER J D *52091
POVOLOTSKAYA M I 52341
PREDOIU C *52579
PRINGLE J L 52091

Q

QUILLEVERE A *52196

R

RAJIC M 52609
RAMEU 52390
RAMMLER R 52115
RASCH R *52071, *52197
REGULSKI W *52092
REICHERT G 52122
REICHLE D E 52701
REIF E *52638
REISER H J 52326
REITER A *52712
REITER E R *52491
REITER R 52491, *52492
REKETTYEY J 52256
RINNE G 52326
ROBINSON F J *52281
ROBOCK K 52650
ROSEN J A *52696
ROTH J *52282
ROTHE K W *52354
ROUSKOVA V *52607
ROZAND J 52270
RUDOLF W 52056
RUEB F *52198
RUEDEN H *52199
RUSSELL J A 52108
RUTENFRANZ J 52638

RYAN J R 52045
RYBIN M *52093
RYOMI H 52054, 52059, 52428, 52430
RYOMI K 52432

S

SADAKANE Y 52432
SAEKI I *52200
SAGAWA E 52333
SAGAWA H *52747
SAIO K *52707
SAITO K 52131, *52470, 52554
SAITO T 52210, 52528
SAKAGUCHI T 52627
SAKAI *52518
SAKAMOTO K *52201
SAKAMOTO Y 52228
SAKANE I 52112
SAKUMA J *52202
SAKURAI S 52636
SAMAIN J 52476
SANO H 52572
SANO S *52493
SANO T *52549
SANTROCH J *52403
SARTEUR R 52511
SARUYAMA H 52423
SASAGAWA T *52494
SASAKI S *52072
SASAKI T *52283
SASAKI Y 52178
SASUGA H *52404
SATO G 52540
SATO H *52664
SATO I *52284, *52495
SATO K 52070
SATO R 52193
SATO S 52065, *52203, *52355
SATO T 52190, 52215, *52285, 52456, 52457
SATO Y 52634, *52639, 52672
SATOMI Y 52546
SATSUMA R 52456
SAWA N *52094
SAWADA H 52191
SAWADA T 52089, 52658, *52697
SAWAMURA H *52204
SAWATARI I *52789
SBRESNY W 52638
SCHEDLING J 52414
SCHILLING H D *52073
SCHMITZ M 52199
SCHMITZ P *52205
SCHOLL G *52665
SCHUENEMAN J J 52785
SCHURATH U 52478
SCHWABE K *52392
SCHWARZBACH E *52074
SEBAYASHI T *52356, *52608
SEKI K *52496, *52497
SEKI M 52161
SEKI Y 52178
SEKIGUCHI M 52565
SELLERIO U 52105
SEMA T 52311
SERA K *52713
SESINOVA V 52614
SHAMADA N *52206
SHAROV P M 52265
SHEPPARD R J *52609
SHIBATA J 52352
SHIBATA T *52748
SHIDARA M *52286, 52306, *52722
SHIGETA A 52371
SHIGETA Y 52384, 52385
SHIMA T 52309
SHIMA Y 52461
SHIMADA I 52554
SHIMANAKA 52305
SHIMIZU K 52216
SHIMIZU M *52570
SHIMIZU T *52207, *52610
SHIMIZU Y 52110
SHIMMURA S 52610
SHIMO M 52358, 52445
SHIMOHARA K 52460
SHIMOUCHI H 52618
SHINKAI A *52749
SHINKEI I 52052
SHINOHARA H *52795
SHINOHARA T *52666, *52667
SHINOYAMA E 52554
SHINOZAKI M *52698
SHIOMI K *52393
SHIOZAWA K 52488, 52490
SHIRAKAWA H *52442
SHIRATA K 52653
SHIRAYAMA H *52498
SHISHIKURA M 52528
SHODA M 52050
SHVETS M N *52317
SINELSHCHIKOVA Z I 52708
SLADKOVIC R 52491
SNOSHIN V A 52513
SOGABE K *52723, *52750
SOKOLOWSKA CWYNAR B 52522
SOMMERS H 52115
SONOBE Y *52519
SPANILY J 52714
STAHFELD D L *52287
STARKOVA B 52402
STARR C *52645
STAUFF J *52075
STEHLE H 52408
STEIOFF W 52638
STENSLAND G J *52531
STOEVENER H H 52632
STRENGE H 52764
STRUSINSKI A *52647
SU E C *52308
SUDA H 52658
SUDO H 52157, 52293
SUEDA A 52059, 52428, 52430, 52432
SUETA A 52433
SUETA S *52460
SUGANO S 52547
SUGI Y 52215
SUGINO S 52119
SUGITO K 52148, 52149
SUGIURA A *52208
SUGIURA G 52216
SUGIURA K *52443, *52668
SUKETA Y 52672
SUMINO K 52633
SUMMERS J C 52106
SUMMERSON W A 52108
SUSEK A 52092
SUTO J *52288
SUTUGIN A G 52564
SUZUKI F *52357
SUZUKI K *52209, *52210, 52254
SUZUKI M *52716
SUZUKI S 52340, *52394, *52405, *52475, 52538, *52550, *52576, *52577, *52578
SUZUKI T 52129, *52358, *52444, 52445, *52724
SUZUKI Y 52636, *52669
SWANBERG C 52683
SWEETON F J 52701
SWIATOSZ E *52095
SYRING F 52080
SZABO O 52288
SZEBENYI I 52288

T

TABET E 52105
TABUCHI S 52441
TACHIBANA K *52359, *52395
TACHIBANA S 52692, 52693
TACHIKAWA N 52360
TADOKORO A 52175
TAJIMA T 52455, *52499
TAJIMA Y 52499
TAKAGI H *52751
TAKAGI M 52438
TAKAGISHI S *52792
TAKAHASHI M 52597
TAKAHASHI Y 52584
TAKAI H 52792
TAKAI Y 52339
TAKAMARU S 52584
TAKAMURA T *52551
TAKASAKI S 52194
TAKASHIMA K 52601
TAKATSUKA M 52439, 52461
TAKAYAMA O *52611
TAKAYAMA T 52362
TAKEDA K 52458, 52584
TAKEMOTO K *52640
TAKESHITA K 52795
TAKEUCHI J *52612
TAKEUCHI K *52500
TAKEUCHI N 52385
TAKEUCHI S *52309
TAKEUCHI T 52447, 52555
TAKEYAMA K *52571
TAKEZOE M 52404
TALLAFUSS A 52414
TAMAOKI A *52289
TANADA S *52290, *52552
TANADA Y *52396
TANAKA K *52790
TANAKA M 52169, *52501
TANAKA N 52260
TANAKA T 52267
TANIBUCHI M *52670
TANIGUCHI N *52397
TANIGUCHI Y 52528
TANIGUNI K *52211
TANIZAKI H 52346
TANTSYREV G D 52341
TASHIRO T 52088
TATE M *52076
TATEISHI M 52135
TEJIMA T *52212
TERAKADO K 52652, 52688, *52699
TERAOKA T *52291
TESHIROGI N *52213
TESHIROGI T *52214
TI OFERN E 52199
THOMAS R S 52320
THOMPSON J K 52314
TIEDTKE K H 52638
TOBA M 52218
TODO N *52215
TOKUDA S 52230
TOMAN P *52096
TOMIHISA N 52206
TOMINAGA H *52360
TOMINAGA K *52502
TOMIZAWA T *52406
TOMOTO H 52070
TONE K 52627
TONOUCHI M *52216
TORII T *52217
TOTSUKA I *52671
TOYAMA I *52572
TOYODA S 52161
TSUBOI N *52218

TSUCHIDA S *52398
TSUCHIMOTO H 52794
TSUCHIYA I *52520
TSUCHIYA K 52060, *52503
TSUJI M *52219
TSUJI Y *52641
TSUJIMOTO F 52070
TSUJINO R *52361
TSUKAHARA M *52292
TSUNETOSHI Y 52610, *52613
TSUNODA F 52636, 52639
TSUNODA H *52642
TSURUBAYASHI K 52327, 52335
TSURUGA T 52157, *52293
TSURUIZUMI A *52553
TUOMI T J *52504
TUSL M *52614
TUTNOVA A V 52628

U

UCHIDA H 52456, 52457
UCHIYAMA S 52088
UEDA A *52077
UEDA T 52247
UEGUCHI N *52532, *52533
UENO S 52444
UESHIMA T *52700
UHLIN L 52321
UMEDA H *52407, *52615
UMEZAWA T 52705
UNO Y 52659
URININ G 52216
USUI Y 52670
UTSUMI S 52418
UTSUNOMIYA M *52752

V

VAN DER WEE P 52511
VAN HEEK K H 52145
VAN HOOK R I JR *52701
VAN RYSSELBERGE M *52797
VAN VORST W D 52253
VEJVODA J *52310
VEKENY H *52220
VENINGA T *52616
VINCENT A L 52248
VOLK M JR *52573
VUK C T *52078
VYSKOCIL A 52614
VYSKUBENKO Y A 52265

W

WADA T 52627
WAGGONER D R 52113
WAGNER H M *52574, 52604
WAKABAYASHI M 52195
WAKASA K *52617
WALTHER H 52354
WANIEK J 52414
WATABE T 52480
WATANABE H *52618, *52729
WATANABE K *52445
WATANABE S *52221
WATANABE T *52222, *52223
WATANABE Y *52097
WATARI Y 52458
WATSON H C *52294
WEAVER E E 52308
WEBER E *52079
WEIGEL P *52735
WELGER K *52080
WHITMORE K E 52696
WICHEPSKI B P 52696
WILLIAMS A L *52505
WITHERSPOON J P 52701
WOLFF B *52408
WOLTER D *52753
WYSZYNSKA H 52647

Y

YADA H 52161
YAGYU H 52634
YAKUO Y 52346
YAMADA H 52087, 52210, *52224
YAMADA N 52601
YAMADA Y *52461, 52516
YAMAGUCHI T *52225
YAMAMICHI Y *52295
YAMAMOTO G 52551
YAMAMOTO M 52544
YAMAMOTO T *52672
YAMAMOTO Y 52480, 52666, 52667, *52673
YAMANAKA 52370
YAMANAKA T *52226
YAMANATA T *52227
YAMANE Y *52471
YAMANO S 52127
YAMASAKI T *52446
YAMASHITA 52305
YAMASHITA I 52346
YAMAYA H *52081
YANAGIHARA S *52554
YANAGISAWA S *52410
YANAMI M 52469
YANO C *52447
YANO H 52669
YANO S 52382
YANO T *52555
YASUDA K *52228
YASUOKA M *52229
YATABE T 52311
YOKOTA N *52230
YOKOYAMA N *52506
YONEDA T *52231
YONEYAMA T 52686
YORIOKA A 52263
YOSHIDA E *52619
YOSHIDA K *52507
YOSHIDA T *52232
YOSHIDA Y *52362
YOSHIFUKU Y 52627
YOSHII K 52398
YOSHIIKE T *52233
YOSHIKAWA S 52146
YOSHIMOTO K 52211
YOSHIMURA A 52597
YOSHINO K *52508
YOSHINORI H *52234
YOSHIZAKI H 52193
YOSHIZAWA S *52363
YOSHIZUMI K 52458

Z

ZAVODSKY D *52472, 52523
ZHELEZNYAKOVA T V 52513
ZHILINSKIY A N 52317
ZIELHUIS R L *52620, *52621

ORDER FORM

USE RESTRICTED AS INDICATED IN THE INTRODUCTION

SEND TO:

ENVIRONMENTAL PROTECTION AGENCY
AIR POLLUTION TECHNICAL INFORMATION CENTER
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

Date____________________

Name____

Program____

Address____

THIS FORM IS TO BE USED FOR ORDERING MICROFICHE DUPLICATES. INDICATE THE ARTICLES YOU REQUIRE BY CIRCLING THEIR APTIC NUMBERS. IF YOU DO NOT HAVE ACCESS TO A MICROFICHE READER, YOU MAY REQUEST PAPER COPIES. HOWEVER, MICROFICHE CAN USUALLY BE PROVIDED IN ABOUT 1/5 THE TIME REQUIRED TO PROVIDE PAPER COPIES.

74292 74293 74294 74295 74296 74298 74299 74300 74301 74302 74303 74304 74305

74306 74307 74308 74309 74310 74311 74312 74313 74314 74315 74316 74318 74319 74320

74321 74322 74323 74324 74325 74326 74327 74328 74329 74330 74331 74332 74333 74334

74335 74336 74337 74338 74339 74340 74341 74342 74343 74344 74345 74346 74347 74348

74349 74350 74351 74352 74353 74354 74355 74356 74357 74358 74359 74360 74361 74362

74363 74364 74365 74366 74367 74368 74370 74371 74372 74373 74374 74375 74376 74377

74378 74379 74380 74381 74382 74383 74384 74385 74386 74387 74388 74389 74390 74391

74392 74393 74394 74396 74397 74398 74399 74400 74402 74403 74404 74405 74406 74407

74408 74409 74410 74411 74412 74413 74414 74415 74416 74417 74418 74420 74421 74423

74424 74426 74427 74428 74429 74430 74431 74432 74434 74435 74436 74437 74438 74439

74440 74441 74442 74443 74444 74445 74446 74447 74448 74449 74451 74452 74453 74454

74456 74457 74458 74460 74461 74462 74463 74464 74465 74466 74467 74468 74469 74470

74471 74472 74473 74474 74475 74476 74477 74478 74479 74480 74481 74482 74483 74484

74485 74486 74487 74488 74489 74490 74491 74492 74493 74494 74495 74496 74498 74500

74501 74502 74503 74504 74505 74506 74507 74508 74509 74510 74511 74513 74514 74515

74516 74517 74518 74519 74520 74521 74523 74524 74525 74526 74527 74528 74529 74530

74531 74532 74533 74534 74535 74536 74537 74538 74539 74540 74541 74542 74543 74544

74545 74546 74547 74548 74549 74550 74551 74552 74553 74554 74555 74556 74557 74558

74559 74560 74561 74562 74563 74564 74565 74566 74567 74568 74569 74572 74573 74574

74575 74576 74577 74578 74579 74580 74581 74582 74583 74585 74586 74587 74588 74589

74590 74591 74592 74593 74594 74595 74596 74598 74599 74600 74603 74604 74605 74606

74607 74608 74609 74611 74612 74613 74614 74615 74616 74617 74618 74619 74620 74621

74622 74624 74625 74626 74627 74628 74629 74630 74631 74632 74633 74634 74635 74636

74637 74638 74639 74640 74641 74642 74643 74644 74645 74646 74647 74648 74650 74651

74652	74653	74654	74655	74656	74657	74658	74659	74660	74661	74662	74663	74664	74665
74666	74667	74668	74669	74670	74671	74672	74673	74674	74675	74676	74677	74678	74679
74680	74681	74682	74683	74684	74685	74686	74687	74688	74689	74691	74693	74695	74697
74698	74699	74700	74701	74702	74703	74704	74705	74707	74708	74709	74710	74712	74713
74714	74715	74716	74717	74718	74719	74720	74721	74723	74724	74725	74726	74727	74728
74729	74730	74731	74732	74733	74741	74742	74743	74744	74745	74746	74747	74748	74749
74750	74752	74754	74755	74756	74758	74759	74760	74761	74763	74764	74765	74766	74767
74769	74770	74771	74772	74773	74774	74775	74776	74777	74778	74779	74780	74781	74782
74783	74784	74785	74786	74787	74788	74789	74790	74791	74792	74794	74795	74796	74797
74798	74799	74800	74802	74803	74804	74805	74806	74807	74808	74809	74810	74811	74812
74813	74814	74816	74817	74818	74819	74820	74821	74823	74824	74825	74826	74827	74828
74829	74830	74831	74832	74833	74834	74835	74836	74837	74838	74839	74840	74841	74842
74843	74844	74845	74846	74847	74849	74850	74851	74852	74853	74854	74855	74856	74857
74858	74859	74860	74861	74862	74863	74864	74865	74866	74867	74868	74869	74870	74871
74872	74873	74874	74875	74876	74878	74879	74880	74882	74883	74884	74885	74886	74887
74888	74889	74890	74891	74892	74893	74894	74895	74896	74897	74898	74899	74900	74901
74902	74903	74904	74905	74906	74907	74909	74910	74911	74912	74913	74914	74915	74916
74917	74918	74919	74920	74921	74922	74923	74924	74925	74926	74927	74928	74929	74930
74931	74932	74933	74934	74935	74936	74937	74938	74939	74940	74941	74942	74943	74944
74945	74946	74948	74949	74950	74951	74952	74953	74954	74955	74956	74957	74958	74959
74960	74961	74962	74963	74964	74966	74967	74968	74969	74970	74971	74972	74973	74974
74975	74976	74977	74978	74979	74981	74982	74983	74984	74985	74986	74987	74988	74989
74990	74991	74992	74993	74994	74995	74996	74998	74999	75000	76640	76641	76642	76644
76645	76646	76648	76649	76650	76651	76652	76653	76654	76655	76657	76658	76659	76660
76661	76662	76663	76665	76666	76667	76668	76669	76670	76671	76672	76673	76674	76675
76676	76677	76678	76679	76680	76681	76682	76683	76684	76685	76686	76687	76688	76689
76690	76691	76692	76693	76694	76695	76696	76698	76699	76700	76701	76702	76703	76704
76705	76706	76707	76708	76709	76710	76711	76712	76713	76714	76715	76716	76717	76718
76719	76720	76721	76722	76723	76724	76725	76726	76727	76728	76729	76730	76731	76732
76733	76734	76735	76736	76737	76738	76739	76740	76741	76742	76743	76744	76745	76746